April 2, 2024

SANTA FE COUNTY
IFB NO. 2024-0210-PW/APS
DISTRICT ATTORNEY OFFICE COMPLEX RENOVATION

ADDENDUM NO. 2

Dear Proponents,

This addendum is issued to reflect the following immediately. It shall be the responsibility of interested Bidders to adhere to any changes or revisions to the IFB as identified in this Addendum No. 2. This documentation shall become permanent and made part of the departmental files.

THE DEADLINE TO SUMBIT BIDS HAS BEEN EXTENDED TO:

Thursday, April 18, 2024 at 2:00pm

Bid Opening will in person at 102 Grant Avenue (1st Floor), Santa Fe or online via WebEx by calling (480) 418-9388 meeting number: 2495 040 4500
https://sfco.webex.com/sfco/j.php?MTID=med11a3e34d9aeb6bfe8ab88bc92e190f

Attachment A: Revised Drawings and Specifications

A- Questions and Answers:

Question No. 1: It is our understanding that Bid Alternates B and C have been removed per revised Bid Form provided with Addendum No. 1. Is that correct?
Answer No. 1: Yes, both Additive Alternates B and C have been removed from the bid.

Question No. 2: It was discussed in the pre-bid conference that the construction phasing is no longer required. This wasn't addressed in Addendum No. 1. Please confirm that the building will be unoccupied by the occupants during construction.
Answer No. 2: Yes, the building will be empty.

Question No. 3: Addendum No. 1 changed the bid time from 04/04/2023 at 2:00pm mountain, to 04/11/2024. Please confirm the time the bid is due. In addition, we respectfully request that the bid date be ended an additional week.
Answer No. 3: Bidding will be extended to 04/18/2023 at 2:00pm

B- <u>Revised and Newly Issued Drawings:</u>

- G-2: Adopted Codes have been amended to reflect CID's current code requirements. And remove references to deleted add alternates.
- C-1: Required modifications to landscaping at entry added with area of new brick paving; see added detail C-1/A6. The "Grassy Knole" is not currently available for construction stagging.
- D-1: Graphic changes have been made to drawing to clarify scope. Area around new conference room has been amended. Removal of section of landscaped area in front entry added; Floor finish removal clarified. Keyed notes corrected for clarity. Prep. of existing pergolas and portals added.
- D-2: Graphic changes have been made to drawing to clarify scope; Floor finish removal clarified. Keyed notes corrected for clarity. Prep. of existing pergolas and portals added.
- D-3: This is a newly issued sheet showing demolition scope on the roof.
- A-1: Graphic changes have been made to drawing to clarify scope; Floor finish removal clarified. Keyed notes corrected for clarity. Re-finish and painting of existing pergolas and portals added. Configuration of movable partition has been changed.
- A-2.1: Graphic changes have been made to drawing to clarify scope; Floor finish removal clarified. Keyed notes corrected for clarity. Re-finish and painting of existing pergolas and portals added.
- A-2.2: Sheet has been revised to only show base bid roof scope.
- A-3: References to deleted add alternates have been removed. Enlargement of the louvers into have penthouse have been shown to enable removal of the cooling tower. Re-finish and painting of existing pergolas and portals added.
- A-4: References to deleted add alternates have been removed. Re-finish and painting of existing pergolas and portals added.
- A-5: New Ceiling scope has been clarified.
- A-6: New Ceiling scope has been clarified.
- A-12: Used scope has been clouded for clarity; unused scope has been indicated.
- A-13: Door Schedule has been corrected.

C- <u>Revisions to Specifications:</u>
See revised Mechanical, electrical and Plumbing specification sections.

<u>D- Additional information and clarification (Included in revised drawings.)</u>

1- Existing Flooring shall be replaced except where indicated to remain.
2- Fire suppression system shall be extended as shown in drawings. Existing sprinkler heads shall be amended to be code compliant "quick response" type throughout.

Please add this Addendum No. 2 to the original proposal documents and refer to proposal documents, hereto as such. This and all subsequent addenda will become part of any resulting contract documents and have effects as if original issued. All other unaffected sections will have their original interpretation and remain in full force and effect. Responders are reminded that any questions or need for clarification must be addressed to Amanda Patterson-Sanchez, Procurement Planner Analyst at apatterson-sanchez@santafecountynm.gov.

CONSTRUCTION NOTES:

GENERAL CONSTRUCTION NOTES:

A. CONTRACTOR SHALL PROVIDE FULL UTILITY LOCATION SURVEY BEFORE CONSTRUCTION.
B. CONTRACTOR SHALL SUBMIT OVERALL PROJECT SCHEDULE TO COUNTY PROJECT MANAGER UPON APPROVAL OF CONTRACT.
C. CONTRACTOR SHALL SUBMIT A TWO WEEK UPDATED SCHEDULE CONTINUOUSLY BI-WEEKLY THROUGHOUT THE DURATION OF CONSTRUCTION; INCLUDING REVISED SCHEDULES AS NEEDED.
D. CONTRACTOR SHALL DOCUMENT CONSTRUCTION WITH PHOTOS.
E. CONTRACTOR SHALL KEEP AND MAINTAIN AS-BUILT DRAWINGS DURING CONSTRUCTION.

EXTERIOR CONSTRUCTION STAGING GENERAL NOTES:

1. CONTRACTOR SHALL BE LIMITED TO ON-SITE PARKING DELINEATED FOR CONSTRUCTION USE ON SITE PLAN 1/C1 UNLESS GIVEN WRITTEN PERMISSION BY COUNTY TO USE ADDITIONAL SPACES.
2. USE OF "GRASSY KNOLL" SHALL FOLLOW LEASE AGREEMENT NO. 2018-00330-PW BETWEEN 200 WEST DE VARGAS STREET ASSOCIATION AND SANTA FE COUNTY; LEASE AGREEMENT PROVIDED IN BID DOCUMENTS.

UTILITY GENERAL NOTES:

1. CONTRACTOR SHALL PROVIDE UTILITY LOCATION SURVEY BEFORE CONSTRUCTION.
2. CONTRACTOR SHALL PROTECT ALL UTILITY'S DURING CONSTRUCTION; REPAIRE OF DAMAGED LINES DURING CONSTRUCTION AND ANY ASSOCIATED DAMAGE SHALL BE CONTRACTOR'S RESPONSIBILITY.

TERMS AND CONDITIONS OF USE OF "GRASSY KNOLL" / PROPERTY LEASED BY THE COUNTY BY 200 WEST DE VARGAS STREET ASSOCIATION:

1. THE GENERAL CONTRACTOR SHALL MAINTAIN A FREE AND OPEN ACCESS AT ALL TIMES TO AND FROM THE ASSOCIATION'S DUMPSTER BIN AREA LOCATED TO THE EAST OF THE GRASSY KNOLL AREA WHERE THE ASSOCIATION TRASH CONTAINERS ARE STORED TO AND FROM THE PEDESTRIAN WALKWAY TO THE NORTH FOR ASSOCIATION / UNIT OWNER/ TENANT USE AT ALL TIMES.
2. THE GENERAL CONTRACTOR SHALL ERECT A SUITABLE, TEMPORARY CONSTRUCTION FENCE SHALL BE ERECTED AROUND THE LEASED PREMISES TO SCREEN THE AREA FROM ASSOCIATION UNIT BUILDINGS DURING THE ENTIRE TIME THIS AGREEMENT IS IN EFFECT.
3. THE MONITORING WELLS LOCATED ON THE LEASED PREMISES OF THE COUNTY AND THE STATE OF NM ED SHALL REMAIN OPEN FOR CONTINUED REMEDIATION MONITORING DURING CONSTRUCTION USE OF THE LEASED PREMISES AT ALL TIMES.
4. THE GENERAL CONTRACTOR SHALL NOT STORE ANY HAZARDOUS WASTE OR PETROLEUM PRODUCTS AT ANY TIME ON THE LEASED PREMISES.
5. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE LEASED PREMISES FROM DAMAGE, CONTROLLING CONSTRUCTION LITTER FROM GOING OFF-SITE AND FRO CLEANING UP THE LEASED PREMISES AND RETURNING IT IN THE SAME CONDITION IT WAS IN AT THE TIME OF THE COMMENCEMENT OF THE LEASE TERM.
6. THE GENERAL CONTRACTOR WILL MAINTAIN THROUGHOUT THE ENTIRE TERM OF THE LEASE COMMERCIAL LIABILITY AND PROPERTY INSURANCE COVERING ITS USE OF THE LEASED PREMISES AND PARKING SPACE AREA, AND THE GENERAL CONTRACTOR'S CERTIFICATE OF INSURANCE SHALL NAME THE "200 WEST DE VARGAS STREET ASSOCIATION" AS AN ADDITIONAL INSURED FOR ITS USE OF THE LEASED PREMISES. THE COUNTY OR THE COUNTY'S GENERAL CONTRACTOR SHALL PROVIDE THE ASSOCIATION PROOF OF SUCH INSURANCE HELD BY THE GENERAL CONTRACTOR BY PROVIDING A CERTIFICATE OF INSURANCE TO THE ASSOCIATION'S PRESIDENT NAMED BELOW REFLECTING SAME.

ADD ALTERNATES:

ADD ALTERNATE A: SECURITY FENCES COMPLETE
A1 - ASSOCIATED DEMOLITION SEEN ON SHEET D-1 SHALL BE EXCLUDED FROM BASE BID.
A2 - SEE SHEET C-1, C-2 & C-3 FOR NEW FENCES.

~~**ADD ALTERNATE B: STUCCO REPAIR AND WINDOW REPLACEMENT:**~~
~~B1 - PATCH EXISTING STUCCO AS NEEDED WITH FIBER-GLASS MESH.~~
~~B2- APPLY EL REY WALLEASE.~~
~~B3 - APPLY EL REY CEMENTITIOUS FINISH SYSTEM.~~
~~B4 - REPLACE ALL EXISTING WINDOWS WITH NEW COMPOSITE CASEMENT WINDOWS.~~

~~**ADD ALTERNATE C: ROOF WORK**~~
~~C1 - REMOVE EXISTING MODIFIED BITUMEN ROOFING COMPLETE DOWN TO DECK.~~
~~C2 - PROVIDE FULLY ADHERED TPO ROOFING; SEE SHEET A-2.2 ROOF PLAN.~~
~~C3 - PROVIDE NEW FLASHING AND COPING AS SEEN ON ROOF PLAN.~~

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GENERAL SHEET NOTES:

A. ALL WORK SHALL FOLLOW CITY, COUNTY, STATE, & FEDERAL CODES.

1

BUILDING CODE ANALYSIS FOR THE EXISTING BUILDING

APPLICABLE CODES FOR PROJECT:

2021 NM COMMERCIAL BUILDING NMAC 14.7.2 (2021 IBC AS AMENDED)
2021 NM EXISTING BUILDING CODE NMAC 14.7.8 (2021 IEBC AS AMENDED)
2021 NM PLUMBING CODE NMAC 14.8.2 (2021 UPC AS AMENDED) A
2021 NM MECHANICAL CODE NMAC 14.9.2 (2021 UMC AS AMENDED)
2020 NM ELECTRICAL CODE NMAC 14.10.4 (2020 NEC AS AMENDED)
2012 NM ELECTRICAL SAFETY CODE NMAC 14.10.5 (2012 NESC AS AMENDED)
2021 NM ENERGY CONSERVATION CODE NMAC 14.7.6 (2021 IECC AS AMENDED)
2015 INTERNATIONAL FIRE CODE
NEW MEXICO ADMINISTRATIVE CODE (NMAC): 14.5.1 GENERAL PROVISIONS; 14.5.2 PERMITS; 14.5.3 INSPECTIONS
2017 ICC A117.1-2017 ANSI STANDARDS

CODE INFORMATION BELOW PER 2021 INTERNATIONAL BUILDING CODE (2021 NEW MEXICO AMENDMENTS)

OCCUPANCY CLASSIFICATION: GROUP B (BUSINESS) FOR OFFICES

CODE COMPLIANCE: 2015 INTERNATIONAL EXISTING BUILDING CORE - 101.4 EXISTING BUILDINGS:
"THE LEGAL OCCUPANCY OF ANY EXISTING BUILDINGS ON THE DATE OF ADOPTION OF THIS CODE SHALL BE PERMITTED TO CONTINUE WITHOUT CHANGE, EXCEPT AS SPECIFICALLY COVERED IN THIS CODE..."

ALLOWABLE BUILDING AREA (TABLE 503):
THE EXISTING DA OFFICE BUILDING IS GROUP B WITH CONSTRUCTION **TYPE 5-B (NOT RATED)** ALLOWS TWO (2) STORIES AND A 9,000 GSF FOOTPRINT IN AREA OF EACH STORY. THE EXISTING THREE (3) STORY PORTION OF THE BUILDING HAS A 7,665 GSF BUILDING FOOTPRINT.

SECTION 504.2 AUTOMATIC SPRINKLER SYSTEM INCREASE WILL ALLOW A ONE-STORY INCREASE FOR A TOTAL OF THREE STORIES ALLOWED WHERE A BUILDING IS EQUIPPED THROUGHOUT WITH AN AUTOMATIC SPRINKLER SYSTEM.

THE EXISTING BUILDING HAS A SPRINKLER SYSTEM FOR THE THREE (3) STORY WING AND NONE IN THE TWO (2) STORY WING BUT THEY ARE SEPARATED WITH A BUILDING SEPARATION OF FIRE RESISTIVE WALLS AND DOORS. THIS CONDITION IS ALLOWED BY CODE AS LONG AS THE FIRE SEPARATION IS MAINTAINED. THE COST TO ADD SPRINKLERS TO THE TWO (2) STORY WEST WING FOR COMPLETE FIRE SPRINKLER PROTECTION THROUGHOUT THE BUILDING IS SHOWN IN THE PRELIMINARY COST REVIEW ON PAGE 9..

2009 INTERNATIONAL EXISTING BUILDING CODE CLASSIFICATION OF WORK:

SECTION 304: ALTERATION LEVEL 2
ALTERATIONS INCLUDE THE RECONFIGURATION OF SPACE, THE ADDITION OR ELIMINATION OF ANY DOOR OR WINDOW, THE RECONFIGURATION OR EXTENSION OF ANY SYSTEM, OR THE INSTALLATION OF ANY ADDITIONAL EQUIPMENT. THE SCOPE OF WORK MAY CHANGE TO REQUIRE ALTERATION LEVEL 3 IF THE WORK AREA EXCEEDS 50 PERCENT OF THE AGGREGATE OF THE BUILDING.

THE ABOVE CODE CITATIONS AND INTERPRETATIONS ARE SUBJECT TO INTERPRETATION BY NEW MEXICO CODE OFFICIALS, INCLUDING THE GOVERNORS COMMITTEE ON THE CONCERNS OF THE HANDICAPPED, DURING THE DESIGN PHASE OF THE PROJECT.

BUILDING OCCUPANT LOAD: TABLE 1004.1.1. OF THE 2015 IBC:
FLOOR AREA IN SQUARE FEET PER OCCUPANT AT 1 OCCUPANT PER 100 SQUARE FEET OF OFFICE AND 15 SQUARE FEET OF MEETING AREA.

FIRST FLOOR			SECOND FLOOR			THIRD FLOOR		
ROOM NAME	AREA	OCCUPANCY	ROOM NAME	AREA	OCCUPANCY	ROOM NAME	AREA	OCCUPANCY
LOBBY	112	8	VICTIM CONF.	272	19	LIBRARY	272	19
RECEPTION	304	3	OFFICE 201	160	2	OPEN OFFICE 301	336	4
WAITING	220	15	OPEN OFFICE 200	240	3	LEROY'S OFFICE	192	2
INTERVIEW 101	210	14	OFFICE 202	165	2	OFFICE 302	124	2
OFFICE 102	143	2	OFFICE 203	125	2	OFFICE 303	124	2
OFFICE 103	192	2	OFFICE 204	125	2	OFFICE 304	96	1
OFFICE 104	180	2	OFFICE 205	160	2	OPEN OFFICE 300	436	5
OFFICE 105	125	2	LARGE CONF.	430	29	OFFICE 305	125	2
OFFICE 106	170	2	OFFICE 206	120	2	OFFICE 306	125	2
OFFICE 107	132	2	OFFICE 207	165	2	OFFICE 307	108	2
OFFICE 108	165	2	OFFICE 208	132	2	OFFICE 308	108	2
OFFICE 109	176	2	OFFICE 209	176	2	OFFICE 309	210	3
OPEN OFFICE 110	464	5	OFFICE 210	144	2	OFFICE 310	174	2
OPEN OFFICE 111	333	3	OPEN OFFICE 211	374	4	OFFICE 311	244	3
OFFICE 112	80	1	OFFICE 212	180	2	DA'S OFFICE	352	4
OFFICE 113	132	2	OFFICE 213	120	2	DA'S SECRETARY	154	2
OFFICE 114	132	2	OFFICE 214	110	2			
LOUNGE	140	10	OFFICE 215	110	2			
OPEN OFFICE 115	546	6	OFFICE 216	120	2			
OFFICE 116	100	1	OFFICE 217	100	1			
OFFICE VEST. 1	143	2						
TOTAL OCCUPANTS	FIRST FLOOR = 88			SECOND FLOOR = 86			THIRD FLOOR = 57	
TOTAL BUILDING OCCUPANCY = 88 + 86 + 57 = **231**								

MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES: 2015 IBC TABLE 2902.1:

BUSINESS OCCUPANCY: 231 OCCUPANTS, ASSUMING 116 MEN AND 116 WOMEN

WATER CLOSETS:
MEN - 1/25 FIRST 50 AND THEN 1/50; 116 MEN = **4 WATER CLOSETS MINIMUM**
WOMEN - 1/25 FIRST 50 AND THEN 1/50; 116 WOMEN = **4 WATER CLOSETS MINIMUM**

LAVATORIES:
MEN 1/40 FIRST 80 AND THEN 1/80; 116 MEN = **3 LAVATORIES MINIMUM**
WOMEN 1/40 FIRST 80 AND THEN 1/80; 116 WOMEN = **3 LAVATORIES MINIMUM**

DRINKING FOUNTAIN:
1 PER 100 = 3 DRINKING FOUNTAINS REQUIRED

SERVICE SINK:
1 REQUIRED

THE EXISTING BUILDING HAS NINE (9) PUBLIC WATER CLOSETS FOR ME AND NINE (9) FOR WOMEN; EIGHT (8) LAVATORIES FOR MEN AND NINE (9) LAVATORIES FOR WOMEN; TWO (2) DRINKING FOUNTAINS AND THREE (3) SERVICE SINKS, ALL OF WHICH EXCEED THE REQUIREMENTS OF THE 2015 INTERNATIONAL BUILDING CODE.

LIFE SAFETY BUILDING SURVEY:

ATTACHED IN THE APPENDIX IS THE REPORT FROM THE ACCENT FIRE SAFETY'S SURVEY OF THE EXISTING BUILDING, FIRE SPRINKLER, AND ALARMS. THE FOLLOWING MAJOR VIOLATIONS WERE NOTED:

- THE SURVEY NOTES THAT THE EXISTING SPRINKLER HEADS MUST BE REPLACED THROUGHOUT.
- THE "COMPACT SHELVING" SECTION ON THE SECOND FLOOR LACKS A REQUIRED 18" CLEARANCE TO THE CEILING (IT IS CURRENTLY LESS THAN 10").
- FIRE SPRINKLER SYSTEMS ARE REQUIRED TO BE INSPECTED EVERY 90 DAYS BY THE STATE FIRE CODE. THE EXISTING SYSTEM HAS NOT BEEN INSPECTED IN THE PAST NINE (9) YEARS.
- THERE CAN BE NO STORAGE OF MATERIALS IN THE EXIT PATH.

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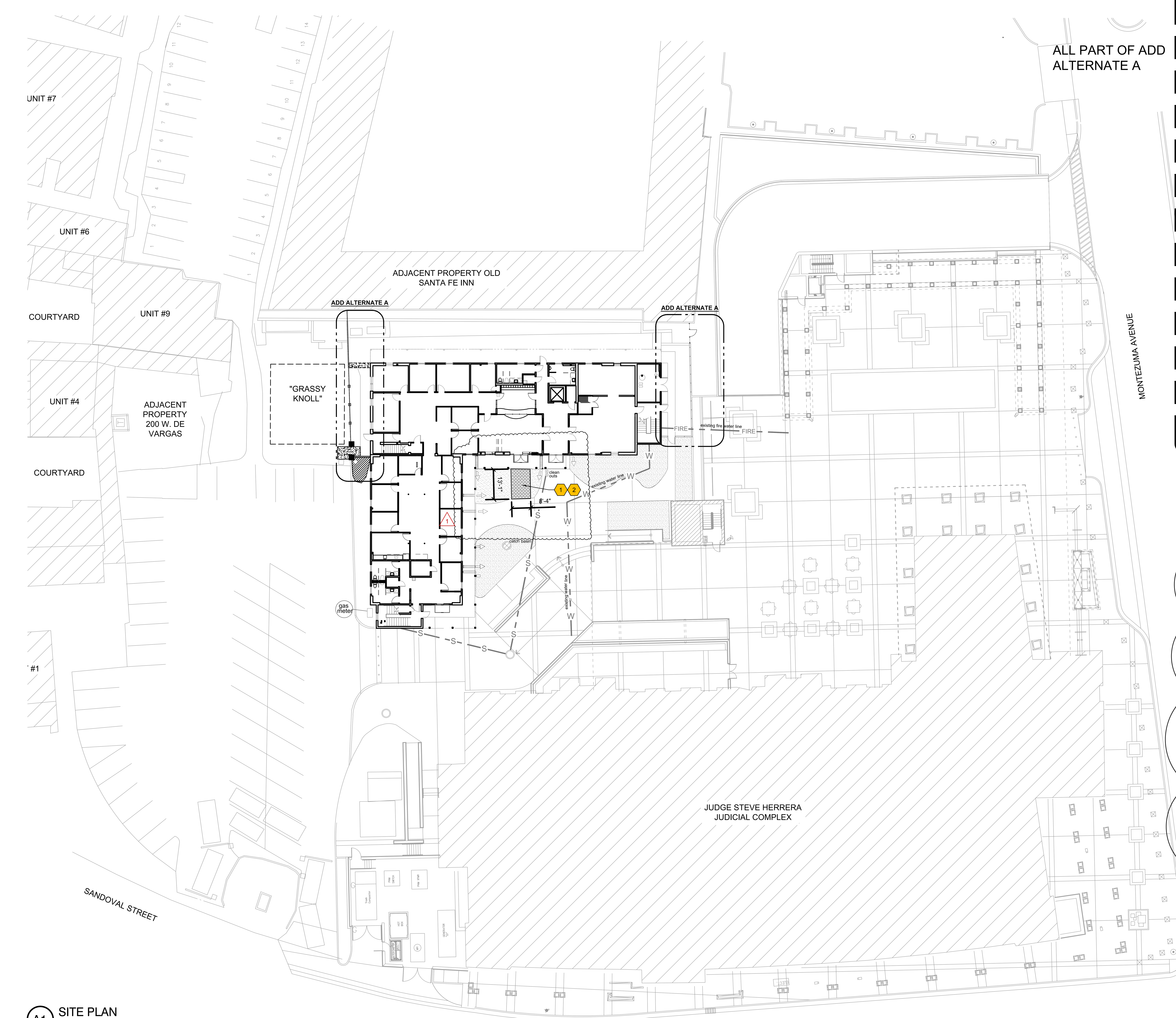
Current Status:
CONFORMED SET

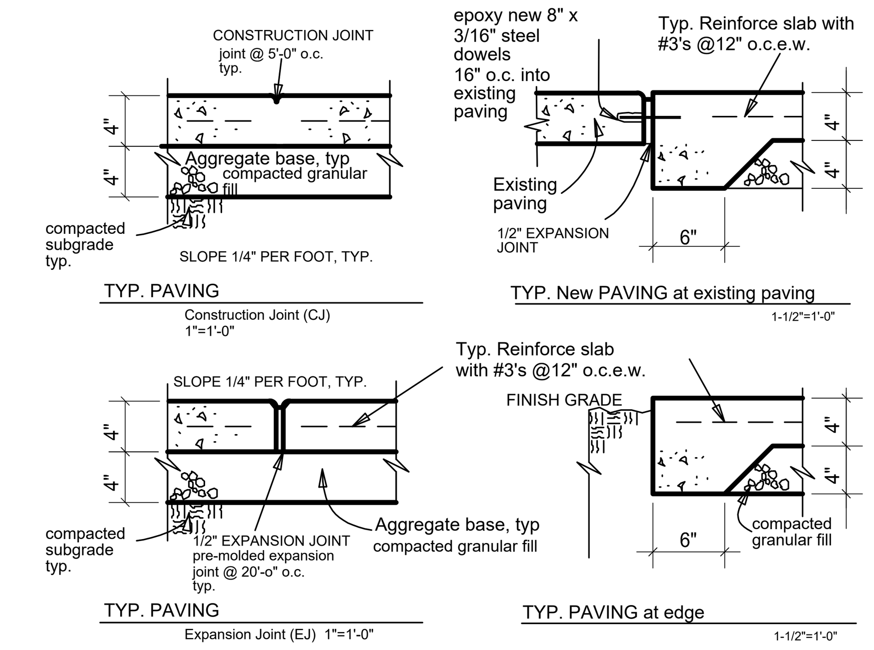
REVISIONS		
1	ADDENDUM-1	3/25/24
-	-	-
-	-	-
-	-	-

Drawn by: KL
Checked by: WL/SM
Date: 01-05-2024
Sheet Title: CODE INFORMATION
Job Number: 2021-41
Sheet No. G-2



A1 SITE PLAN

1" = 20'
0 10' 20' 40'
SCALE: 1" = 20'-0"



2/C1 NEW CONCRETE PAVING DETAILS

1"=1'-0"

Site Plan Legend:

- Existing area of landscape & irrigation which shall remain. Protect L/S and irrigation during construction.
- Existing roof drain downspout discharge onto grade.
- Existing steel plate cover over concrete roof drain channel in sidewalk.
- New concrete paving (see 3/C1 and details) added to existing paving. Remove & cap landscaping and irrigation.
- New grading for positive drainage

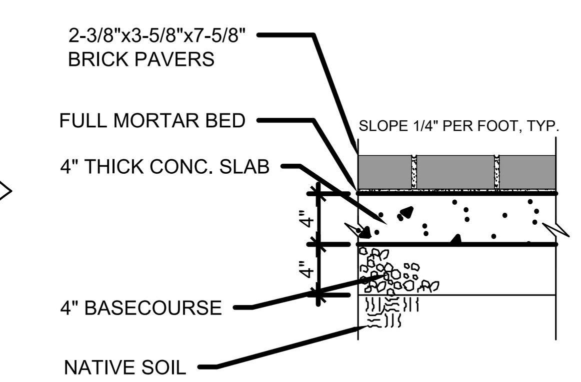
UTILITY GENERAL NOTES:

1. CONTRACTOR SHALL PROVIDE UTILITY LOCATION SURVEY BEFORE CONSTRUCTION.
2. CONTRACTOR SHALL PROTECT ALL UTILITY'S DURING CONSTRUCTION; REPAIRE OF DAMAGED LINES DURING CONSTRUCTION AND ANY ASSOCIATED DAMAGE SHALL BE CONTRACTOR'S RESPONSIBILITY.

1

KEYED NOTES NOTES:

1. REMOVE SECTION OF EXISTING LANDSCAPED AREA; REMOVE AND CAP EXISTING IRRIGATION SYSTEM WHERE AFFECTED.
2. PROVIDE NEW BRICK PAVING ON NEW CONC. SLAB WITH SUB-GRADE PREPARATIONS; SEE DETAIL A6/C1.



A6 BRICK PAVING DETAIL

1"=1'-0"

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Current Status: BIDDING

REVISIONS		
1	ADDENDUM-2	3/29/24
-	-	-
-	-	-
-	-	-

Drawn by: KL

Checked by: WL/SM

Date: 01-05-2024

Sheet Title: SITE PLAN & PAVING DETAILS

Job Number: 2021-41

Sheet No. C-1

PLOT DATE: Mar 29, 2024 - 3:38pm
FILENAME: X:\2021-41 santa fe das office reno\cad files_SHEETS\2021-41_C-1.dwg

A1 FIRST FLOOR DEMOLITION PLAN

1/8" = 1'-0"

UTILITY GENERAL NOTES:

1. CONTRACTOR SHALL PROVIDE UTILITY LACTATION SURVEY BEFORE CONSTRUCTION
2. CONTRACTOR SHALL PROTECT ALL UTILITY'S DURING CONSTRUCTION; REPAIR OF DAMAGED LINES DURING CONSTRUCTION AND ANY ASSOCIATED DAMAGE SHALL BE CONTRACTORS RESPONSIBILITY.

GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING IS TO BE PROTECTED DURING ALL PHASES OF WORK.
E. COORDINATE WITH OWNER FOR SALVAGE OR DISPOSAL OF FIXTURES.
F. REMOVE EXISTING FLOORING THROUGHOUT PREP FOR NEW SCHEDULED FLOORING.
G. GENERAL CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND STRUCTURE IN THE FIELD BEFORE STARTING DEMOLITION AND REPORT ANY DISCREPANCIES TO ARCHITECT.
H. VERIFY THAT CONSTRUCTION INDICATED FOR REMOVAL AND DEMOLITION IS NOT BEARING OR ATTACHED TO ACTIVE UTILITY LINES.
I. DISPOSAL OF DEMOLISHED MATERIALS SHALL COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSAL OF ALL DEMOLISHED MATERIALS OFF SITE ANY MATERIALS LEFT ON SITE PAST WORKING HOURS SHALL BE STORED & PROTECTED IN A SAFE & CLEAN MANNER & ACCEPTABLE TO THE PUBLIC.
J. REMOVE ALL HANGERS, STRAPS, BRACKETS, ETC. ASSOCIATED WITH EQUIPMENT, DUCTWORK, CONDUIT AND PIPING THAT IS REMOVED.
K. ALL EXISTING UTILITIES SHALL BE PROTECTED. DAMAGED LINES MUST BE REPAIRED AND RESTORED TO SERVICE BY THE CONTRACTOR.
L. REMOVE EXISTING FLOORING THROUGHOUT UNLESS OTHERWISE INDICATED; FLOORING TO REMAIN IN STAIRS AND UTILITY SPACES; PREP FOR NEW FLOORING WHERE FLOOR DEMO. OCCURS.

SHEET KEYED NOTES

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1. REMOVE EXISTING DOOR AND/OR WINDOW FOR NEW WINDOW (OR SALVAGED DOOR/WINDOW) INSTALLATION IN NEW ROUGH OPENING. PROVIDE FIELD MEASUREMENTS FOR SALVAGED DOOR/WINDOW NEW WALL CUTS. NEW OPENING WILL INCLUDE HEADER AND JAMB SUPPORT.
2. REMOVE EXISTING DOOR FOR THE NEW DOOR INSTALLATION IN THE EXISTING DOOR FRAME WITH NEW HARDWARE.
3. REMOVE PARTITION WALL, DOOR & FRAME COMPLETE.
4. REMOVE PLUMBING FIXTURES, TOILET STALLS, SINKS AND COUNTERS FOR INSTALLATION OF NEW BATHROOM FIXTURES. CUT AND CAP UTILITY AND PLUMBING LINES AS NEEDED TO ALLOW NEW FIXTURE INSTALLATION.
5. EXISTING STAIRS; NO SCOPE; PROJECT.
6. REMOVE SECTION OF EXISTING WALL FOR NEW OPENING; REMOVE SECTION FOR NEW HEADER; CONFIRM ROUGH OPENING SIZE.
7. REMOVE WALLS, COUNTER & CABINETS OF KITCHENETTE. RELOCATE UTILITY, ELECTRICAL AND DATA LINES FOR NEW KITCHENETTE CONSTRUCTION..
8. REMOVE EXISTING DRINKING FOUNTAIN AND RELOCATE PLUMBING AND ELECTRICAL LINES FOR NEW DRINKING FOUNTAIN AT THIS LOCATION.
9. REMOVE AND SALVAGE DOUBLE DOOR CONSTRUCTION WITH TRANSOM AND SIDE LIGHT WINDOWS AND TRIM TO NEW OPENING AT ENTRY LOBBY AS SHOWN ON A-1.
10. PREP EXISTING PORTAL COLUMNS AND EXISTING PORTAL ABOVE FOR NEW PAINT
11. REMOVE EXISTING WALK-OFF MAT.
12. REMOVE EXISTING TILE FLOORING; PREP FOR NEW TILE FLOORING.
13. REMOVE SECTION OF CONCRETE SITE WALK.
14. REMOVE SECTION OF CONCRETE CURB.
15. PREP EXISTING CONCRETE SIDEWALK FOR NEW RECESSED WALK-OFF MAT.
16. REMOVE EXISTING DOWNSPOUT; PROTECT ACCLIMATED TRENCH DRAIN AND OR PLASH BLOCK; SEE ELEVATIONS.
17. REMOVE BOILER COMPLETE; PROTECT ALL OTHER EXISTING TO REMAIN IN MECH. ROOM.
18. REMOVE EXISTING CARPET AND VCT FLOORING; TYP.
19. EXISTING PROTECT; TYPICAL.
20. REMOVE SECTION OF EXISTING LANDSCAPING; RELOCATE AND CAP IRRIGATION LINES. ESCAVATE TO FACILITATE NEW PAVING; SEE A6/C-1.

SHEET LEGEND

EXISTING TO REMAIN; PROTECT

TO BE REMOVED.

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Current Status:
BIDDING

REVISIONS		
1	ADDENDUM-2	3/29/24
-	-	-
-	-	-
-	-	-

Drawn by: KL

Checked by: WL/SM

Date: 01-05-2024

Sheet Title:
FIRST FLOOR DEMOLITION FLOOR PLANS

Job Number: 2021-41

Sheet No.
D-1

PLOT DATE: Apr 01, 2024 - 6:57pm
FILENAME: X:\2021-41 santa fe das office reno\cad files_SHEETS\2021-41_D-1.dwg

GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.
E. COORDINATE WITH OWNER FOR SALVAGE OR DISPOSAL OF FIXTURES.
F. REMOVE EXISTING FLOORING THROUGHOUT PREP FOR NEW SCHEDULED FLOORING.
G. GENERAL CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND STRUCTURE IN THE FIELD BEFORE STARTING DEMOLITION AND REPORT ANY DISCREPANCIES TO ARCHITECT.
H. VERIFY THAT CONSTRUCTION INDICATED FOR REMOVAL AND DEMOLITION IS NOT BEARING OR ATTACHED TO ACTIVE UTILITY LINES.
I. DISPOSAL OF DEMOLISHED MATERIALS SHALL COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSAL OF ALL DEMOLISHED MATERIALS OFF SITE.
J. REMOVE ALL HANGERS, STRAPS, BRACKETS, ETC. ASSOCIATED WITH EQUIPMENT, DUCTWORK, CONDUIT AND PIPING THAT IS REMOVED.
K. ALL EXISTING UTILITIES SHALL BE PROTECTED. DAMAGED LINES MUST BE REPAIRED AND RESTORED TO SERVICE BY THE CONTRACTOR.

SHEET KEYED NOTES

1. EXISTING LEAD PAINT AT STAIRS SHALL NOT BE DISTURBED; NOT IN SCOPE OF WORK.
2. REMOVE EXISTING PARTITION WALL (AND DOORS & FRAME) COMPLETE AS SHOWN.
3. PREP PORTAL FOR NEW PAINT; PREP BRICK COPPING FOR REPAIR.
4. REMOVE PLUMBING FIXTURES, TOILET STALLS, SINKS AND COUNTERS FOR INSTALLATION OF NEW BATHROOM FIXTURES. CUT AND CAP UTILITY AND PLUMBING LINES AS NEEDED TO ALLOW NEW FIXTURE INSTALLATION. PATCH CERAMIC TILE (AND OTHER CUT SURFACES) TO MATCH EXISTING.
5. REMOVE ALL 12" SQUARE VINYL FLOOR TILE IDENTIFIED IN REMEDIATION REPORT TO HAVE ASBESTOS CONTENT (APPROXIMATELY 28 SQ. FT.) WITH A LICENSED ASBESTOS REMOVAL COMPANY. REMOVAL DEBRIS SHALL BE PROPERLY PACKAGED AND TRANSPORTED TO A LICENSED ASBESTOS LAND FILL.
6. REMOVE WALLS, COUNTER & CABINETS OF KITCHENETTE. RELOCATE UTILITY, ELECTRICAL AND DATA LINES FOR NEW KITCHENETTE CONSTRUCTION..
7. REMOVE EXISTING DRINKING FOUNTAIN AND RELOCATE PLUMBING AND ELECTRICAL LINES FOR NEW DRINKING FOUNTAIN AT THIS LOCATION.
8. PREP EXISTING EXPOSED WOOD RAILINGS AND, CORBELS AND FACING AT BALCONIES FOR NEW FINISH; REMOVE ROTTED WOOD AND LOOSE MATERIAL; INCLUDING CORBELS, LINTELS, TONGUE AND GROOVE DECKING AND COLUMNS.
9. REMOVE EXISTING DOOR & FRAME; PREP FOR NEW WALL IN-FILL.
10. REMOVE EXISTING CARPET AND VCT THROUGHOUT; PREP FOR NEW FLOORING OF SAME TYPE.
11. REMOVE EXISTING TILE FLOORING; PREP FOR NEW TILE FLOORING.
12. REMOVE EXISTING COOLING TOWER COMPLETE; PREP EXISTING PENETRATION AND PROVIDE TEMPORARY SEAL TILL NEW CONSTRUCTION.
13. REMOVE EXISTING METAL LOUVERS; ENLARGE OPENING TO FACILITATE REMOVAL OF COOLING TOWER; SEE DEMOLITION ELEVATIONS.
14. REMOVE EXISTING SHELVING COMPLETE.
15. REMOVE SECTION OF WALL FOR NEW DOOR & FRAME & HEADER; CONFIRM ROUGH OPENING SIZE.

1

SHEET LEGEND

EXISTING TO REMAIN; PROTECT

TO BE REMOVED.

A1 SECOND FLOOR DEMOLITION PLAN
1/8" = 1'-0"

A2 THIRD FLOOR DEMOLITION PLAN
1/8" = 1'-0"

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

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NM FIRST JUDICIAL DISTRICT ATTORNEY

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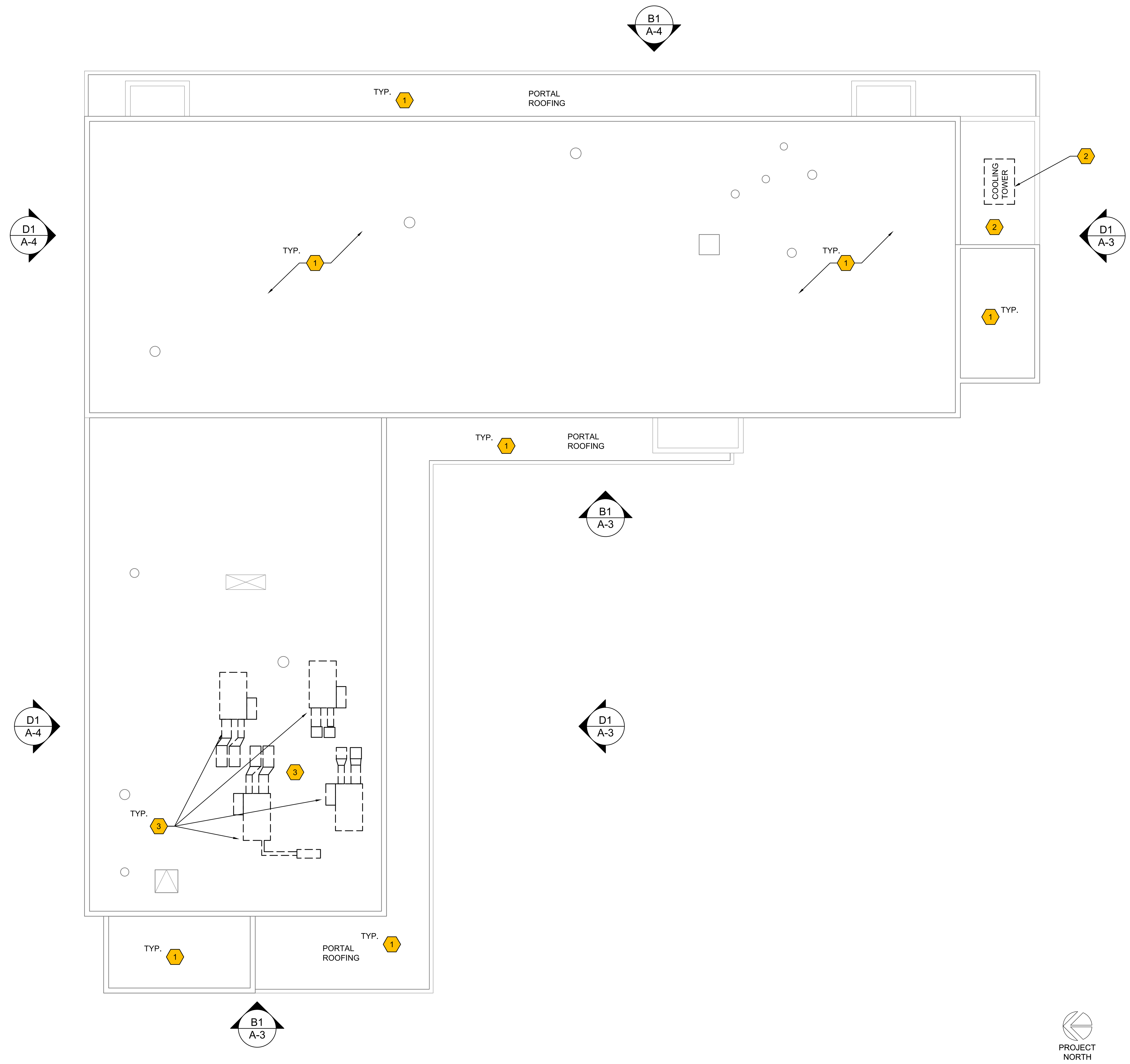
Checked by:
Date: 01-
Sheet Title:
SECOND & F DEMOL
Job Number: 20
Sheet No.
D-2

PLOT DATE: Apr 01, 2024 - 1:40pm
FILENAME: X:\2021-41 santa fe das office reno\cad files_SHEETS\2021-41_D-2.dwg



A1 ROOF PLAN

1/8" = 1'-0"

SCALE: 1/8" = 1'-0"

GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.
E. EXISTING CHILLER IS TO BE REMOVED COMPLETE.
F. ALL NEW AND EXISTING ROOF PENETRATION SHALL BE FLASHED AND SEALED PER ROOFING MANUFACTURES SPECIFICATIONS.
G. ALL NEW AND EXISTING ROOF TOP EQUIPMENT SHALL BE FLASHED AND SEALED PER ROOFING MANUFACTURES SPECIFICATIONS.

SHEET KEYED NOTES

1. EXISTING SINGLE LAYER OF BITUMEN ROOFING ; PROTECT.
2. REMOVE EXISTING COOLING TOWER; PATCH EXISTING ROOF PENETRATION.
3. REMOVE EXISTING RTU'S DUCTWORK AND CURBS COMPLETE; PATCHING SHALL BE COORDINATED SO THAT ROOF DOES NOT LEAK.

SHEET LEGEND

EXISTING
NEW

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1	ADDENDUM-1	03/26/24
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Drawn by: KL
Checked by: WL/SM
Date: 01-05-2024
Sheet Title: DEMOLITION ROOF PLAN

Job Number: 2021-41
Sheet No.
D-3

PLOT DATE: Apr 01, 2024 - 7:40pm
FILENAME: X:\2021-41 Santa Fe DAs Office Reno\CAD Files_SHEETS\2021-41_D-3.dwg

A1 FIRST FLOOR PLAN

1/8" = 1'-0"

SCALE: 1/8" = 1'-0"

GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
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C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.
E. COORDINATE WITH OWNER FOR SALVAGE OR DISPOSAL OF FIXTURES.

SHEET KEYED NOTES

1. NEW ACOUSTICAL MOVABLE PARTITION; BASIS OF DESIGN MODERN FOLD ACOUSTI-SEAL PREMIER 932 WITH STC RATING OF 50.
2. NEW RUBBER RECESSED WALK-OFF MAT.
3. POUR NEW SECTION OF CONCRETE TO MATCH COLOR OF EXISTING WHERE REMOVED WALK-OF MATT WAS. CONCRETE MIN. 3,000 PSI AND MIN. 3" THICK
4. NEW GYP. SOFFIT ABOVE FOR MOVEABLE PARTITION; SEE RCP.
5. NEW WINDOW; SEE SCHEDULE AND TYPES.
6. PAINT EXISTING WOOD COLUMNS & EXPOSED WOOD IN CARPORT STRUCTURE ABOVE; REPLACE AND REPAIR BRICKS IN COPPING AND RE-POINT AND RE-GROUT AS NEEDED..

SHEET LEGEND

EXISTING

NEW

EXISTING DOOR WITH NEW ACCESS CONTROL AND ASSOCIATED HARDWARE; SEE DOOR SCHEDULE

NEW OR RELOCATED EXISTING DOOR; SEE DOOR SCHEDULE

NEW OR RELOCATED EXISTING WINDOW; SEE WINDOW TYPES/SCHEDULE

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327 SANDOVAL STREET,
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Drawn by: KL

Checked by: WL/SM

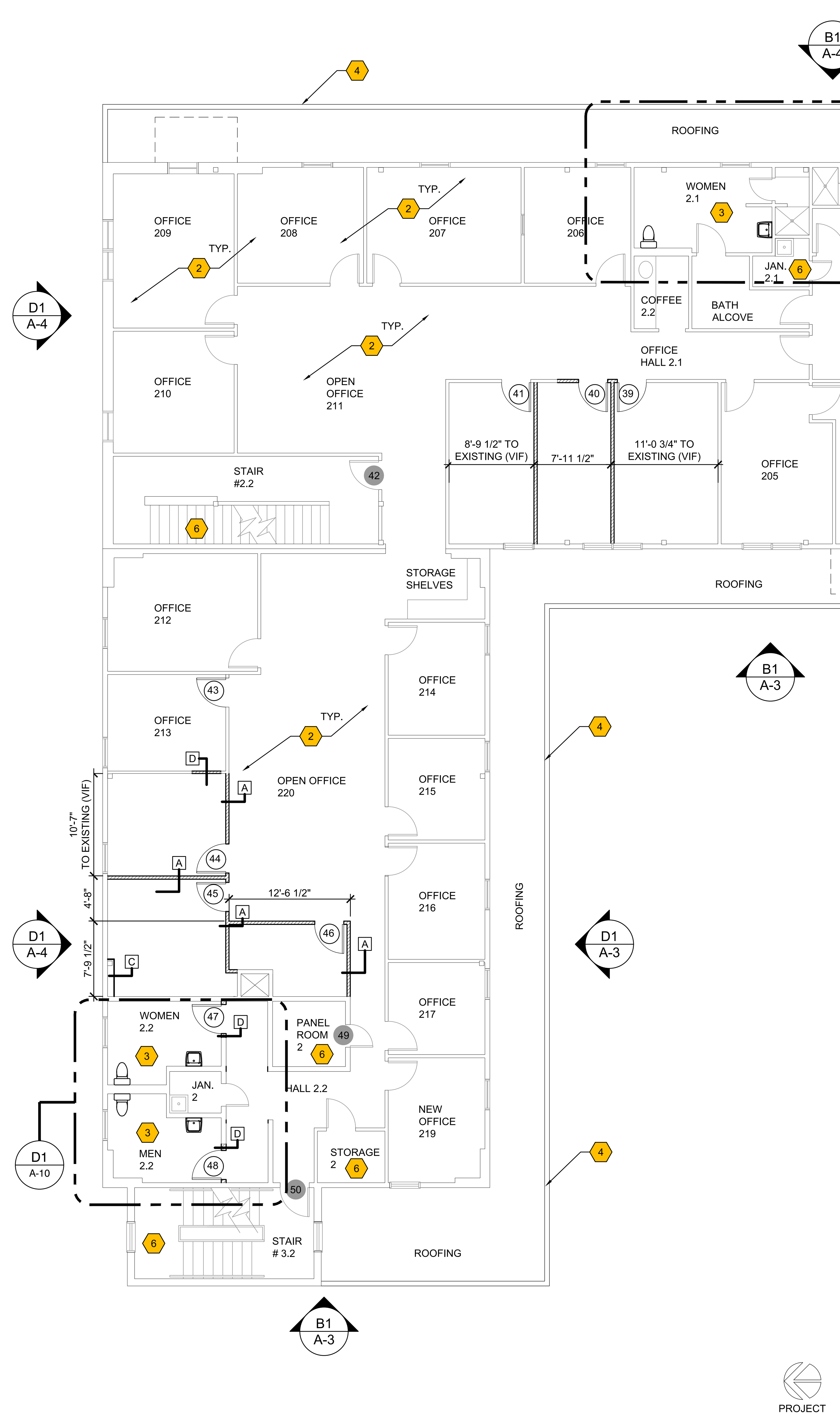
Date: 01-05-2024

Sheet Title: FIRST FLOOR PLAN

Job Number: 2021-41

Sheet No. A-1

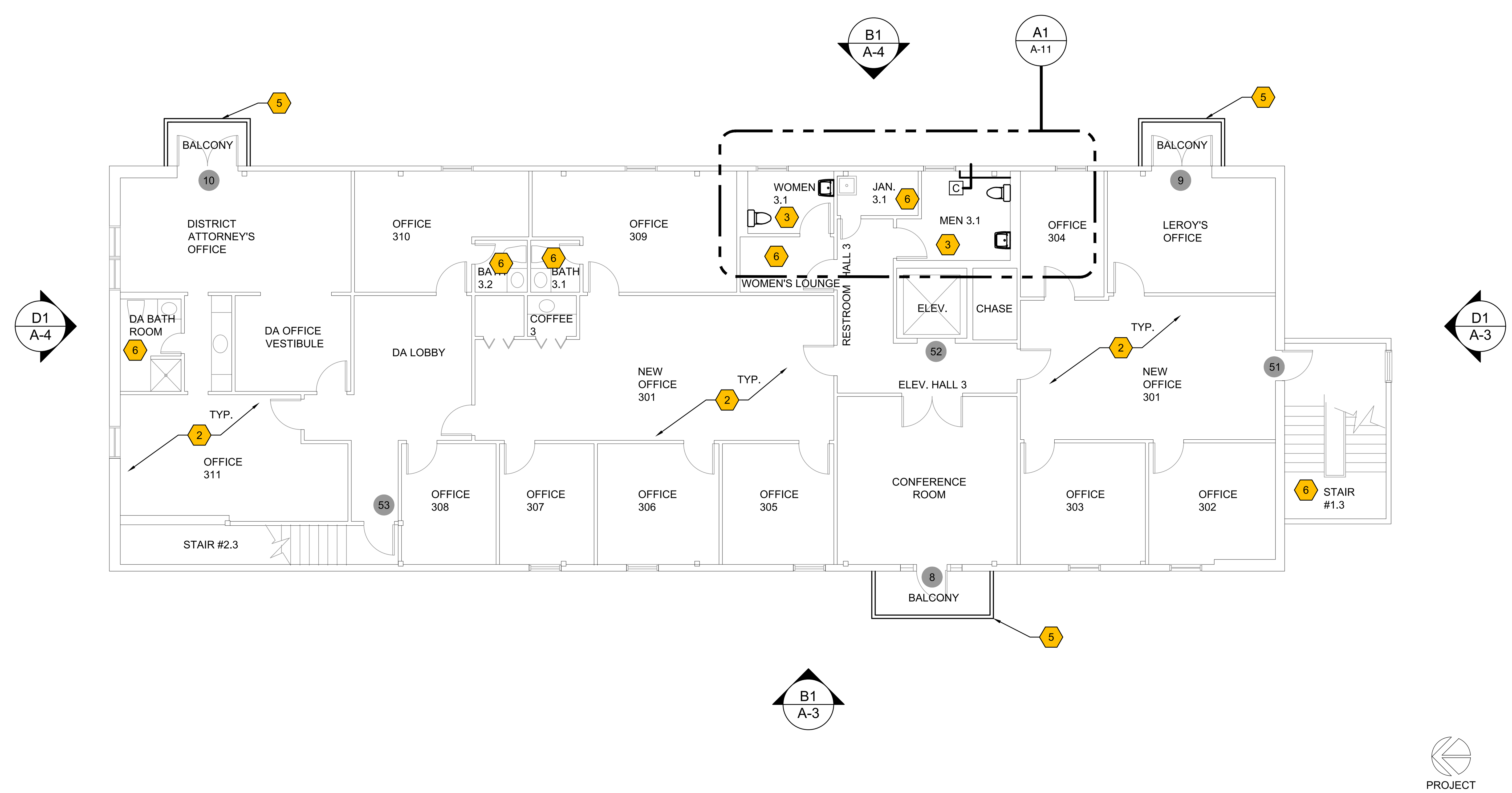
PLOT DATE: Apr 01, 2024 - 7:06pm
FILENAME: X:\2021-41 santa fe das office reno\cad files_SHEETS\2021-41_A-1.dwg



A1 SECOND FLOOR PLAN

1/8" = 1'-0"

SCALE: 1/8" = 1'-0"



A3 THIRD FLOOR PLAN

1/8" = 1'-0"

SCALE: 1/8" = 1'-0"

GENERAL SHEET NOTES

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B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.
E. COORDINATE WITH OWNER FOR SALVAGE OR DISPOSAL OF FIXTURES.
F. DOORS 44-49 SHALL BE SALVAGED EXISTING DOORS.
G. ALL EXISTING WINDOWS SHALL BE REPLACED WITH NEW; SEE SHEET A-13 FOR WINDOW SCHEDULES TYPES & DETAILS.

SHEET KEYED NOTES

1. PATCH AND SKIM COAT EXISTING WALLS IN AREAS WHERE REMOVED CASEWORK SHELVING HAS DAMAGED WALLS TO PROVIDE A MINIMUM LEVEL 4 PAINTED FINISH.

1

2. NEW CARPET & VCT FLOORING; TYPICAL; SEE FINISH SCHEDULE.
3. NEW TILE FLOORING; SEE FINISH SCHEDULE.
4. RE-FINISH EXPOSED WOOD OF EXISTING PORTALS; PATCH & FILL EXISTING MATERIAL AS NEEDED; REPLACE BRICK IN COPPING AS NEEDED; RE-POINT AND GROUT BRICK AS NEEDED.
5. RE-FINISH EXPOSED WOOD RAILINGS OF EXISTING PORCHES ; REPLACE EXISTING WOOD DECKING WITH NEW 2X6 D.FIR DECKING. ALL WOOD SHALL RECEIVE 2 COATS OF OIL BASED EXTERIOR STAIN WITH INTEGRAL FINISH.
6. EXISTING FLOORING TO REMAIN.

SHEET LEGEND

EXISTING

NEW

EXISTING DOOR WITH NEW ACCESS CONTROL AND ASSOCIATED HARDWARE; SEE DOOR SCHEDULE

NEW OR RELOCATED EXISTING DOOR; SEE DOOR SCHEDULE

NEW OR RELOCATED EXISTING WINDOW; SEE WINDOW TYPES/SCHEDULE

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1	ADDENDUM-2	03/29/24
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Drawn by: KL
Checked by: WL/SM
Date: 01-05-2024

Sheet Title:
SECOND & THIRD FLOOR PLAN

Job Number: 2021-41
Sheet No.
A-2.1

PLOT DATE: Mar 29, 2024 - 2:41pm
FILENAME: X:\2021-41 santa fe das office reno\cad files_SHEETS\2021-41_A-2.1.dwg

GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.
E. EXISTING CHILLER IS TO BE REMOVED COMPLETE.
F. ALL NEW AND EXISTING ROOF PENETRATION SHALL BE FLASHED AND SEALED PER ROOFING MANUFACTURES SPECIFICATIONS.
G. ALL NEW AND EXISTING ROOF TOP EQUIPMENT SHALL BE FLASHED AND SEALED PER ROOFING MANUFACTURES SPECIFICATIONS.

SHEET KEYED NOTES

1. EXISTING SINGLE LAYER OF BITUMEN ROOFING PROTECT.
2. NEW 60 MILL TPO ROOFING AT MECHANICAL PENTHOUSE; IN-FILL PENETRATION FOR REMOVED COOLING TOWER. SEAL PENETRATIONS FOR LINE-SETS FOR MECHANICAL EQUIPMENT.
3. PATCH EXISTING SINGLE LAYER OF BITUMEN ROOFING WHERE RTU'S WHERE LOCATED.
4. NEW ROOF PENETRATIONS SHALL HAVE METAL FLASHING AND ROOFING CEMENT. PRIME EXISTING ROOFING AROUND NEW PENETRATION.
5. NEW MECHANICAL CONDENSERING UNITS ON NEW PADS.

SHEET LEGEND

EXISTING
NEW

A1 ROOF PLAN

1/8" = 1'-0"

SCALE: 1/8" = 1'-0"

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1	ADDENDUM-2	3/29/24
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Drawn by: KL
Checked by: WL/SM
Date: 01-05-2024
Sheet Title: ROOF PLAN & DETAILS; ADD ALTERNATE B

Job Number: 2021-41
Sheet No. A-2.2

PLOT DATE: Apr 01, 2024 - 3:58pm
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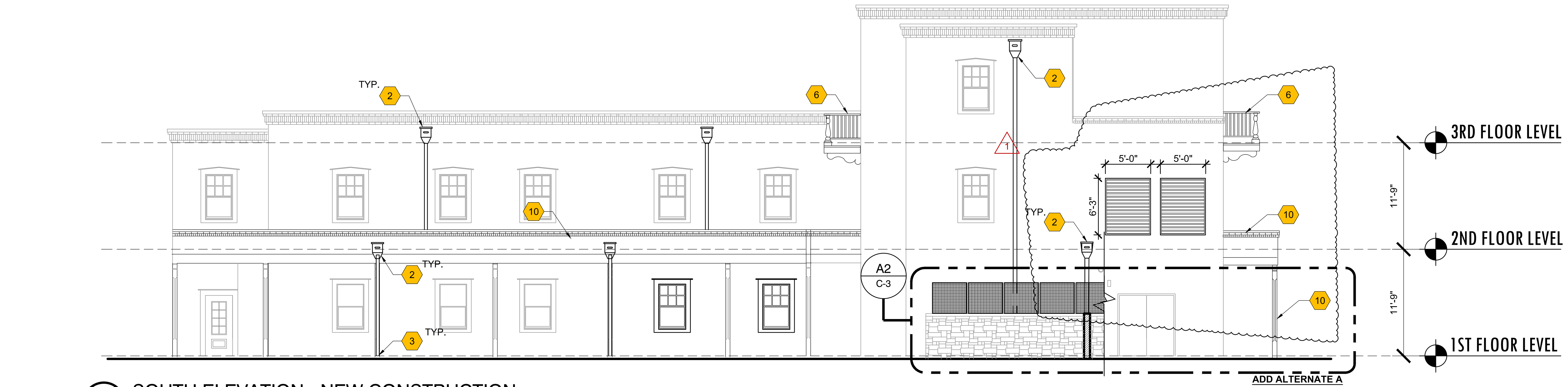
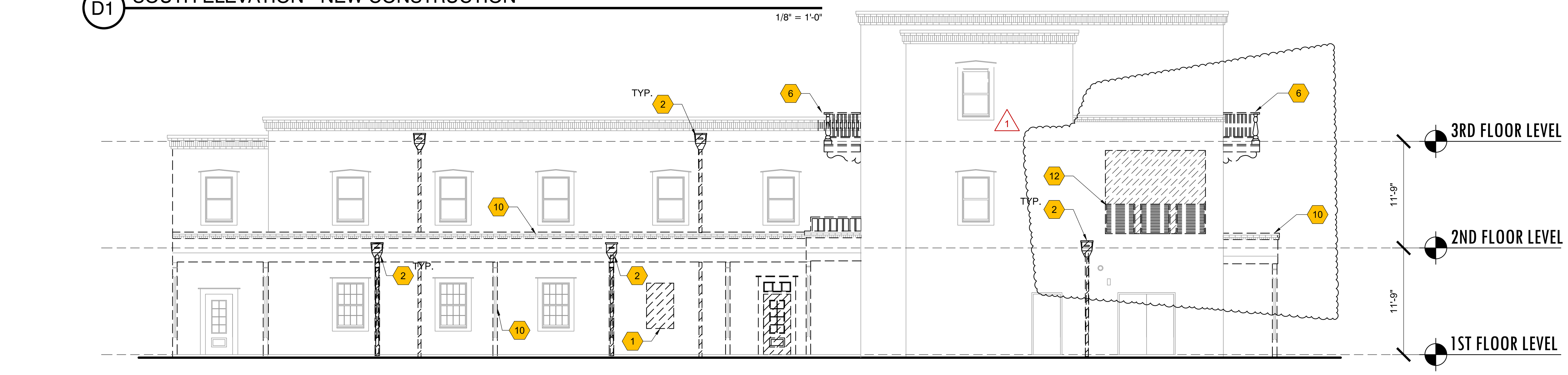
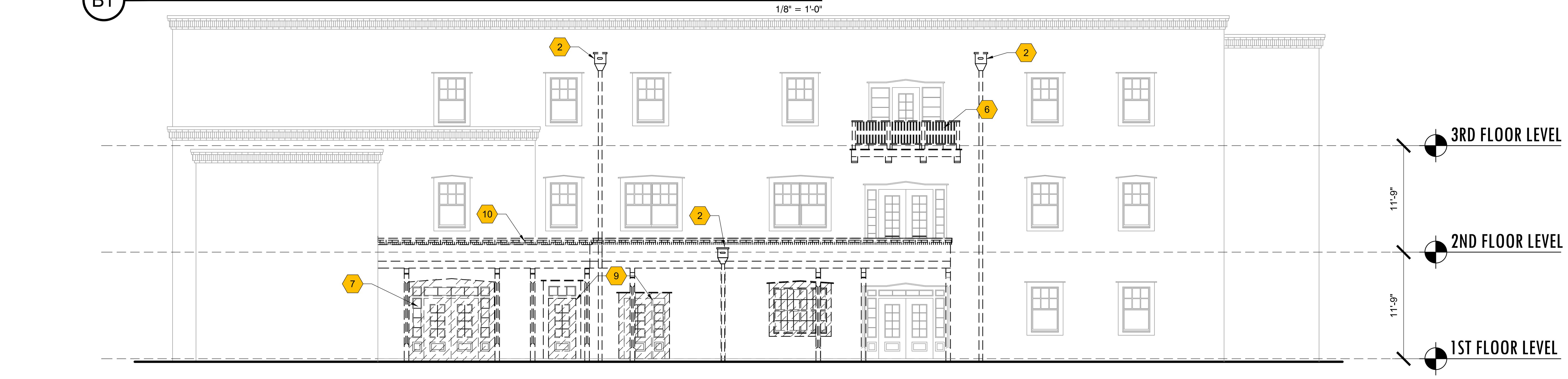


D1 SOUTH ELEVATION - NEW CONSTRUCTION
1/8" = 1'-0"



C1 SOUTH ELEVATION - EXISTING & DEMOLITION
1/8" = 1'-0"

B1 WEST ELEVATION - NEW CONSTRUCTION
1/8" = 1'-0"



A1 WEST ELEVATION - EXISTING & DEMOLITION
1/8" = 1'-0"

GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.
E. COORDINATE WITH OWNER FOR SALVAGE OR DISPOSAL OF FIXTURES.
F. DEMOLITION OF EXISTING WORK SHALL BE DONE IN SUCH A MANNER THAT IT WILL NOT DAMAGE EXISTING STRUCTURES, FIXTURES, ETC. PROTECT WORKERS AND PUBLIC FROM INJURY AND REPORT ANY HAZARDOUS CONDITIONS THAT MAY OCCUR.
G. GENERAL CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND STRUCTURE IN THE FIELD BEFORE STARTING DEMOLITION AND REPORT ANY DISCREPANCIES TO THE ARCHITECT.
H. VERIFY ALL UTILITIES PRIOR TO DEMOLITION; CONFIRM ALL TO BE REMOVED DOES NOT INTERACT WITH UTILITIES TO REMAIN.
I. DISPOSAL OF DEMOLISHED MATERIALS SHALL COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSAL OF ALL DEMOLISHED MATERIALS OFF SITE.
J. REMOVE ALL HANGERS STRAPS, BRACKETS, ETC. ASSOCIATED WITH EQUIPMENT, DUCTWORK, CONDUIT AND PIPING THAT IS REMOVED.
K. ALL EXISTING UTILITIES SHALL BE PROTECTED. DAMAGED LINES MUST BE REPAIRED AND RESTORED TO SERVICE BY THE CONTRACTOR.
L. REMOVE AND REPLACE ALL WINDOWS IN THE EXISTING BUILDING. SEE NOTES FOR EXCEPTIONS, SALVAGE AND SOME DOOR REPLACEMENT.
M. REMOVE AND REPLACE ALL ROOFTOP WATER "CONDUCTOR HEADS" AND DOWNSPOUTS AS NOTED.

SHEET KEYED NOTES

1

1. CUT OPENING INTO EXISTING FRAME/STUCCO WALL FOR NEW TYPE "A" WINDOWS. NOTE: LOWER LEVEL PLANNED OPENING FOR NEW WINDOW MAY HAVE AN EXISTING WINDOW OPENING IN THE FRAME WHICH HAS BEEN CLOSED UP WITH STUCCO AND FRAME WALLS.
2. REPLACE EXISTING ROOF SCUPPER AND COLLECTOR HEAD AND DOWNSPOUT TO GRADE; MATCH EXISTING CONDUCTOR HEAD AND SCUPPER CONSTRUCTION.
3. NEW PRE-CAST CONCRETE SPLASH BLOCK.
4. NOT USED.
5. NOT USED.
6. RE-PAINT AND RE-FINISH EXISTING BALCONY; SEE D-1 AND D-2 FOR PREP. REPLACE LOOSE OR ROTTED MATERIAL; APPLY (1) COATS PRIME, (1) COAT FINISH WITH OIL BASED EXTERIOR PAINT.
7. EXISTING DOUBLE DOOR WITH TRANSOM AND SIDELIGHTS; REMOVE COMPLETE & SALVAGE FOR RE-USE ; RE-INSTALL IN NEW LOCATION AND REPLACE DAMAGED AS NEEDED.
8. IN-FILL SECTION OF EXISTING WITH WALL FRAMING AND STUCCO SYSTEM TO MATCH EXISTING.
9. REMOVE EXISTING DOOR WITH TRANSOM & SALVAGE FOR USE LATER IN PROJECT.
10. PAINT EXPOSED WOOD IN EXISTING PORTAL; REPLACE BRICK AND RE-POINT AND RE-GROUT WHERE NEEDED; SEE D-1 AND D-2 FOR PREP.
11. REMOVE EXISTING DOOR, TRIM AND TRANSOM COMPLETE; SALVAGE FOR RE-USE.
12. REMOVE EXISTING LOUVER GRILLS; ENLARGE OPENING FOR NEW HEADER AND NEW GRILL.
13. NEW STEEL HEADER AND NEW ALUMINUM GRILL.

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Drawn by: KL
Checked by: WL/SM
Date: 01-05-2024
Sheet Title: BUILDING ELEVATIONS; SOUTH & WEST
Job Number: 2021-41
Sheet No.
A-3

PLOT DATE: Apr 01, 2024 - 7:16pm
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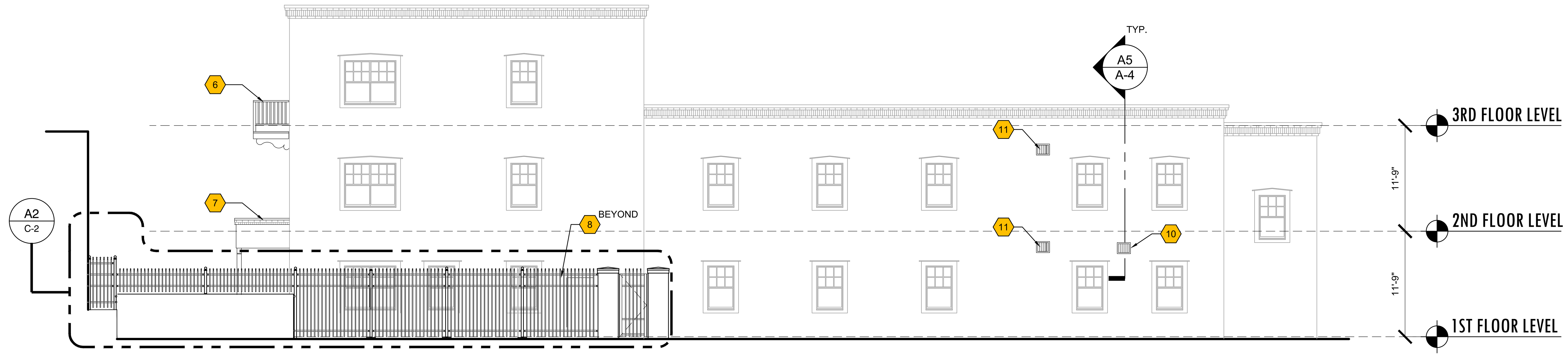
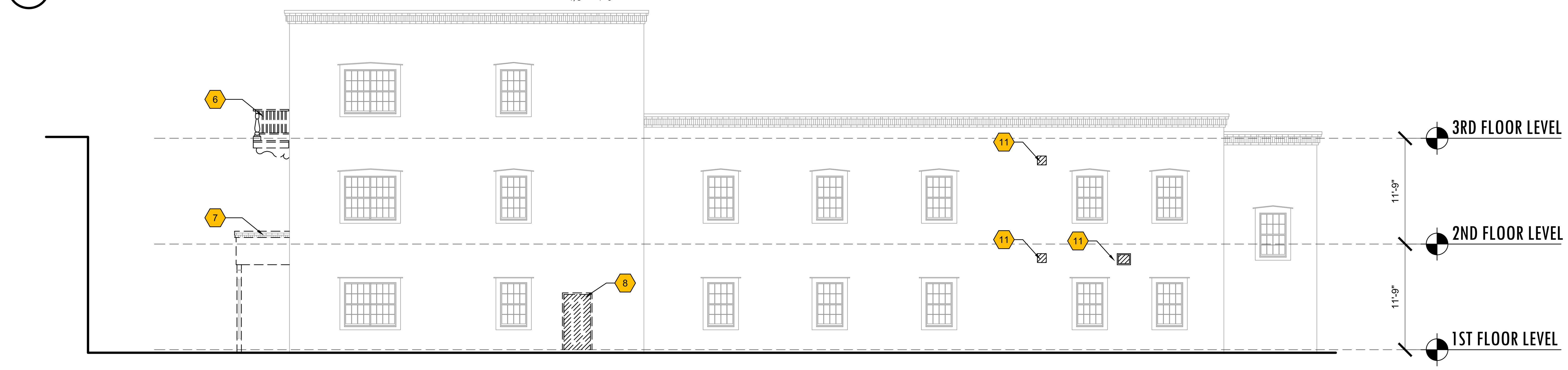
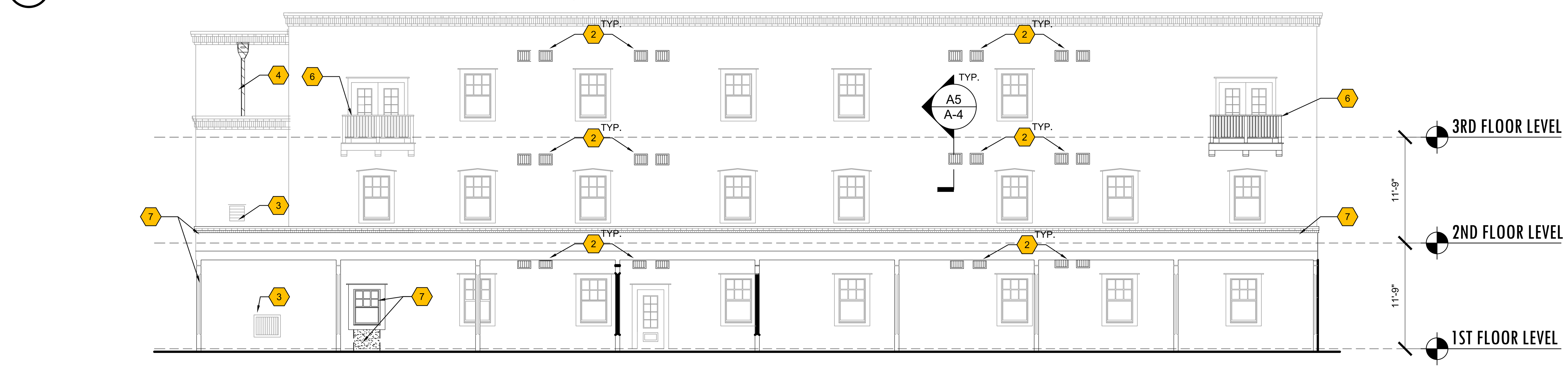


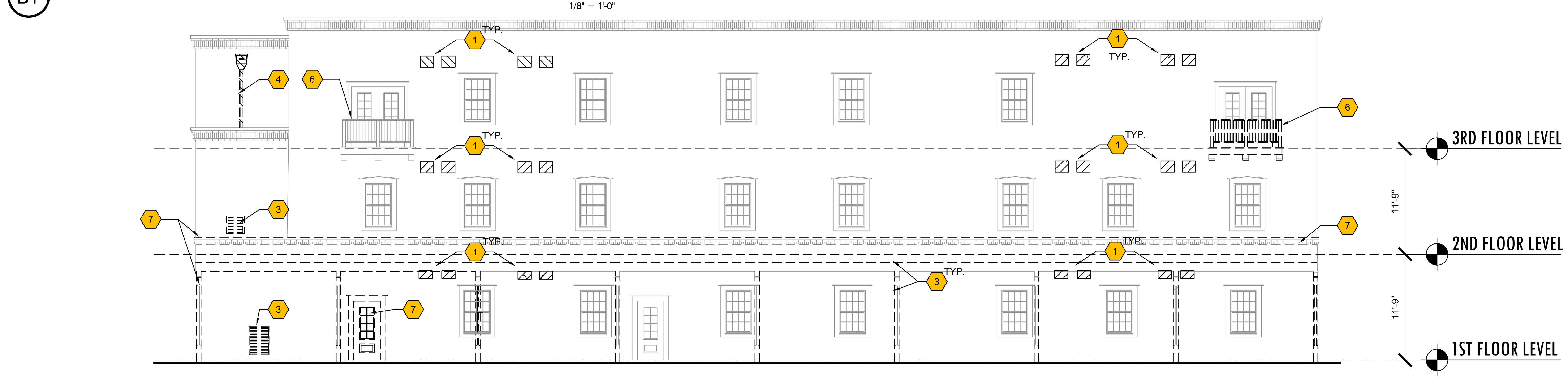
D1 NORTH ELEVATION - NEW CONSTRUCTION
1/8" = 1'-0"



C1 NORTH ELEVATION - EXISTING & DEMOLITION
1/8" = 1'-0"



B1 EAST ELEVATION - NEW CONSTRUCTION
1/8" = 1'-0"



A1 EAST ELEVATION - EXISTING & DEMOLITION
1/8" = 1'-0"

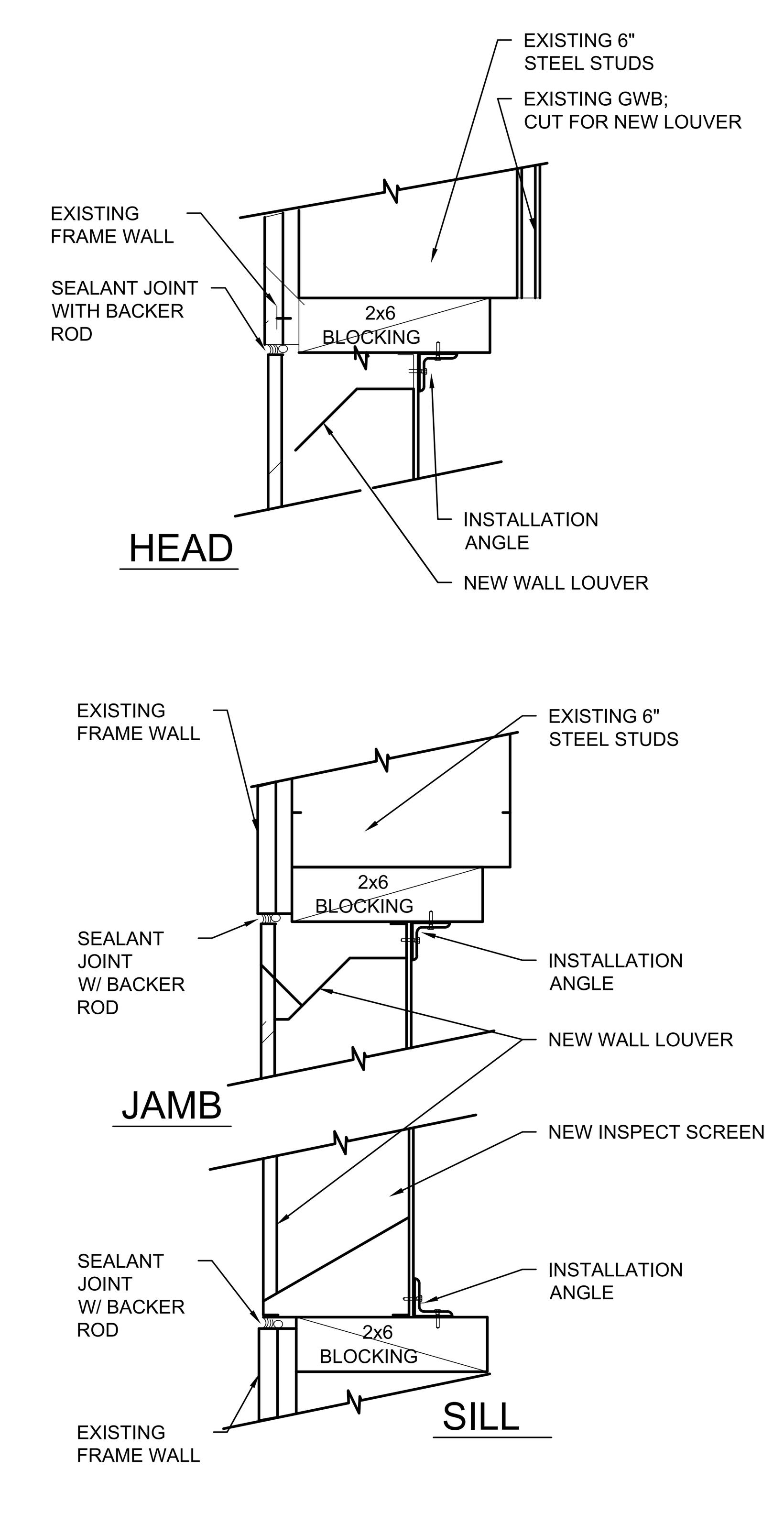
GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.
E. COORDINATE WITH OWNER FOR SALVAGE OR DISPOSAL OF FIXTURES.
F. DEMOLITION OF EXISTING WORK SHALL BE DONE IN SUCH A MANNER THAT IT WILL NOT DAMAGE EXISTING STRUCTURES, FIXTURES, ETC. PROTECT WORKERS AND PUBLIC FROM INJURY AND REPORT ANY HAZARDOUS CONDITIONS THAT MAY OCCUR.
G. GENERAL CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND STRUCTURE IN THE FIELD BEFORE STARTING DEMOLITION AND REPORT ANY DISCREPANCIES TO THE ARCHITECT.
H. VERIFY ALL UTILITIES PRIOR TO DEMOLITION; CONFIRM ALL TO BE REMOVED DOES NOT INTERACT WITH UTILITIES TO REMAIN.
I. DISPOSAL OF DEMOLISHED MATERIALS SHALL COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSAL OF ALL DEMOLISHED MATERIALS OFF SITE.
J. REMOVE ALL HANGERS STRAPS, BRACKETS, ETC. ASSOCIATED WITH EQUIPMENT, DUCTWORK, CONDUIT AND PIPING THAT IS REMOVED.
K. ALL EXISTING UTILITIES SHALL BE PROTECTED. DAMAGED LINES MUST BE REPAIRED AND RESTORED TO SERVICE BY THE CONTRACTOR.
L. REMOVE AND REPLACE ALL WINDOWS IN THE EXISTING BUILDING. SEE NOTES FOR EXCEPTIONS, SALVAGE AND SOME DOOR REPLACEMENT.
M. REMOVE AND REPLACE ALL ROOFTOP WATER "CONDUCTOR HEADS" AND DOWNSPOUTS AS NOTED.

SHEET KEYED NOTES

1

1. CUT EXISTING WALL FOR NEW 12"X15" WALL LOUVERS FOR NEW HVAC SYSTEM. SEE DETAIL 5/A-4. LEVEL CUTS & LOUVERS WITH EACH OTHER AND WITHIN THE WALL FOR CONSISTENT HEIGHTS.
2. PROVIDE AND INSTALL TWO (2) 12"X15" (LOUVER AREA) GRILLES FOR NEW HVAC SYSTEM IN EXISTING WALLS; SEE DETAIL A1/ A-4.
3. EXISTING LOUVERS REMAIN.
4. REPLACE EXISTING ROOF SCUPPER AND COLLECTOR HEAD AND DOWNSPOUT TO GRADE; MATCH EXISTING CONDUCTOR HEAD AND SCUPPER CONSTRUCTION.
6. RE-PAINT AND RE-FINISH EXISTING BALCONY; SEE D-1 AND D-2 FOR PREP. REPLACE LOOSE OR ROTTED MATERIAL; APPLY (1) COATS PRIME, (1) COAT FINISH WITH OIL BASED EXTERIOR PAINT.
7. PAINT & RE-FINISH EXPOSED WOOD IN EXISTING PORTAL; REPLACE BRICK AND RE-POINT AND RE-GROUT WHERE NEEDED; SEE D-1 AND D-2 FOR PREP.REMOVE EXISTING DOOR; PROVIDE WALL OPENING IN EXISTING WALL AND INSTALL NEW (CUSTOM SIZE) WINDOW ASSEMBLY IN DOOR OPENING; INFILL WITH NEW WALL ASSEMBLY TO MATCH EXISTING.
8. EXISTING WINDOW AND/ OR DOOR ASSEMBLY REMAINS; REPAIR WOOD, FILL HOLES, PATCH AND PAINT TO MATCH EXISTING.
9. PATCH AREA OF EXISTING STUCCO WITH FIBER MESH AND NEW STUCCO SYSTEM TO MATCH EXISTING.
10. CUT EXISTING WALL OPENINGS AND PROVIDE NEW 18"X14" WALL LOUVERS FOR NEW HVAC SYSTEM. SEE DETAIL A1/A-4.
11. CUT EXISTING WALL OPENINGS AND PROVIDE FOR NEW VENT FOR MICROWAVE OVENS.



A6 TYP. LOUVER DETAILS
3" = 1'-0"

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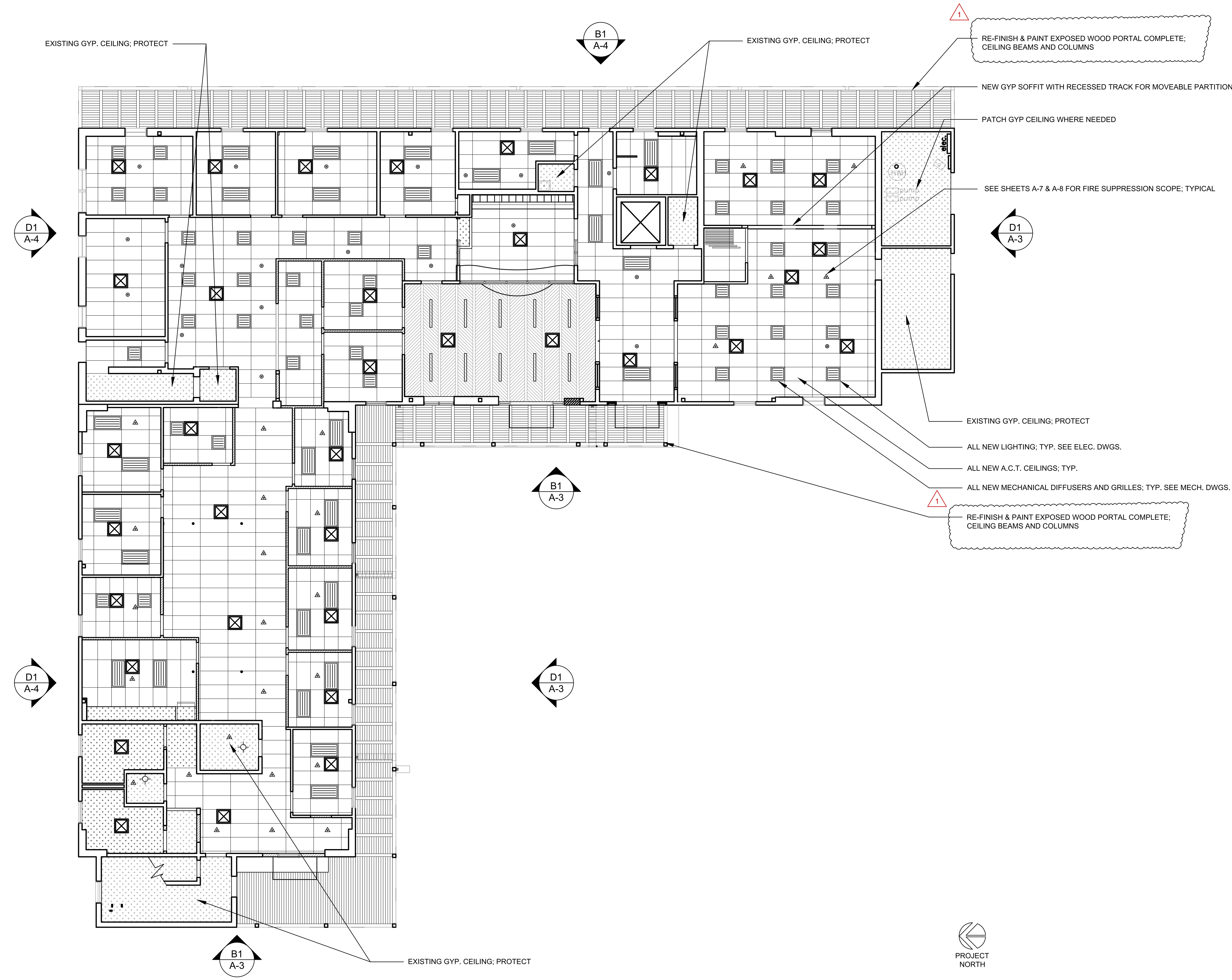
Drawn by: KL
Checked by: WL/SM
Date: 01-05-2024
Sheet Title: BUILDING ELEVATIONS; NORTH & EAST
Job Number: 2021-41
Sheet No.
A-4

PLOT DATE: Apr 01, 2024 - 3:00pm
FILENAME: X:\2021-41 santa fe das office reno\cad files_SHEETS\2021-41_A-4.dwg



A1 FIRST FLOOR REFLECTED CEILING PLAN

1/8" = 1'-0"

GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.

CEILING TYPE LEGEND

- EXISTING SUSPENDED GYPSUM BOARD CEILING
- NEW SUSPENDED GYPSUM BOARD CEILING
- 48"x 24" NEW LAY-IN ACOUSTICAL CEILING
- 24"x 24" NEW LAY-IN ACOUSTICAL CEILING
- EXISTING INTERIOR WOOD CEILING (RE-FINISH)
- EXISTING EXTERIOR WOOD CEILING (RE-FINISH AND PAINT)

LIGHTING FIXTURE LEGEND

- 48" X 24" NEW LAY-IN LIGHT FIXTURE
- 24" X 24" NEW LAY-IN LIGHT FIXTURE
- NEW LIGHT FIXTURE
- NEW LIGHT FIXTURE
- NEW CEILING MOUNTED ELEC. FIXTURES

FIRE LEGEND

- NEW SMOKE DETECTOR
- NEW CEILING SPEAKER IN NEW CEILING
- EXISTING FIRE SPRINKLER HEAD; V.I.F. EXISTING HEAD SHALL BE REPLACED WITH "QUICK RESPONSE" HEAD.
- NEW WALL MOUNTED FIRE SPRINKLER HEAD; EXTEND EXISTING SYSTEM TO REACH NEW AREAS OF COVERAGE
- EXISTING WALL MOUNTED FIRE SPRINKLER HEAD; VIF EXISTING HEAD SHALL BE REPLACED WITH "QUICK RESPONSE" HEAD.
- NEW CEILING MOUNTED FIRE SPRINKLER HEAD EXTEND EXISTING SYSTEM TO REACH NEW AREAS OF COVERAGE

HVAC LEGEND

- NEW HVAC SUPPLY REGISTER
- NEW HVAC RETURN REGISTER
- NEW 12" x 12" CEILING EXTRACT FAN
- NEW 8" x 8" CEILING EXTRACT FAN

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REVISIONS		
1	ADDENDUM-2	3/29/24
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Drawn by: KL
Checked by: WL/SM
Date: 01-05-2024
Sheet Title: FIRST FLOOR REFLECTED CEILING PLANS
Job Number: 2021-41
Sheet No. A-5

PLOT DATE: Apr 01, 2024 - 2:59pm
FILENAME: X:\2021-41 santa fe das office reno\cad files_SHEETS\2021-41_A-5.dwg

GENERAL SHEET NOTES

A. ALL DIMENSIONS MUST BE VERIFIED IN FIELD.
B. ALL SITE INFORMATION SHOWN FOR REFERENCE ONLY. ACTUAL LOCATIONS MUST BE VERIFIED IN FIELD.
C. ALL EXISTING SHALL REMAIN UNLESS OTHERWISE NOTED.
D. ALL EXISTING TO REMAIN IS TO BE PROTECTED DURING ALL PHASES OF WORK.

CEILING TYPE LEGEND

- EXISTING SUSPENDED GYPSUM BOARD CEILING
- NEW SUSPENDED GYPSUM BOARD CEILING
- 48"x 24" NEW LAY-IN ACOUSTICAL CEILING
- 24"x 24" NEW LAY-IN ACOUSTICAL CEILING
- EXISTING INTERIOR WOOD CEILING (RE-FINISH AND RE-PAINTED)
- EXISTING EXTERIOR WOOD CEILING (RE-FINISH AND RE-PAINTED)

LIGHTING FIXTURE LEGEND

- 48" X 24" NEW LAY-IN LIGHT FIXTURE
- 24" X 24" NEW LAY-IN LIGHT FIXTURE
- NEW LIGHT FIXTURE
- NEW LIGHT FIXTURE
- NEW CEILING MOUNTED ELEC. FIXTURES

FIRE LEGEND

- NEW SMOKE DETECTOR
- NEW CEILING SPEAKER IN NEW CEILING
- EXISTING FIRE SPRINKLER HEAD; V.I.F. EXISTING HEAD SHALL BE REPLACED WITH "QUICK RESPONSE" HEAD.
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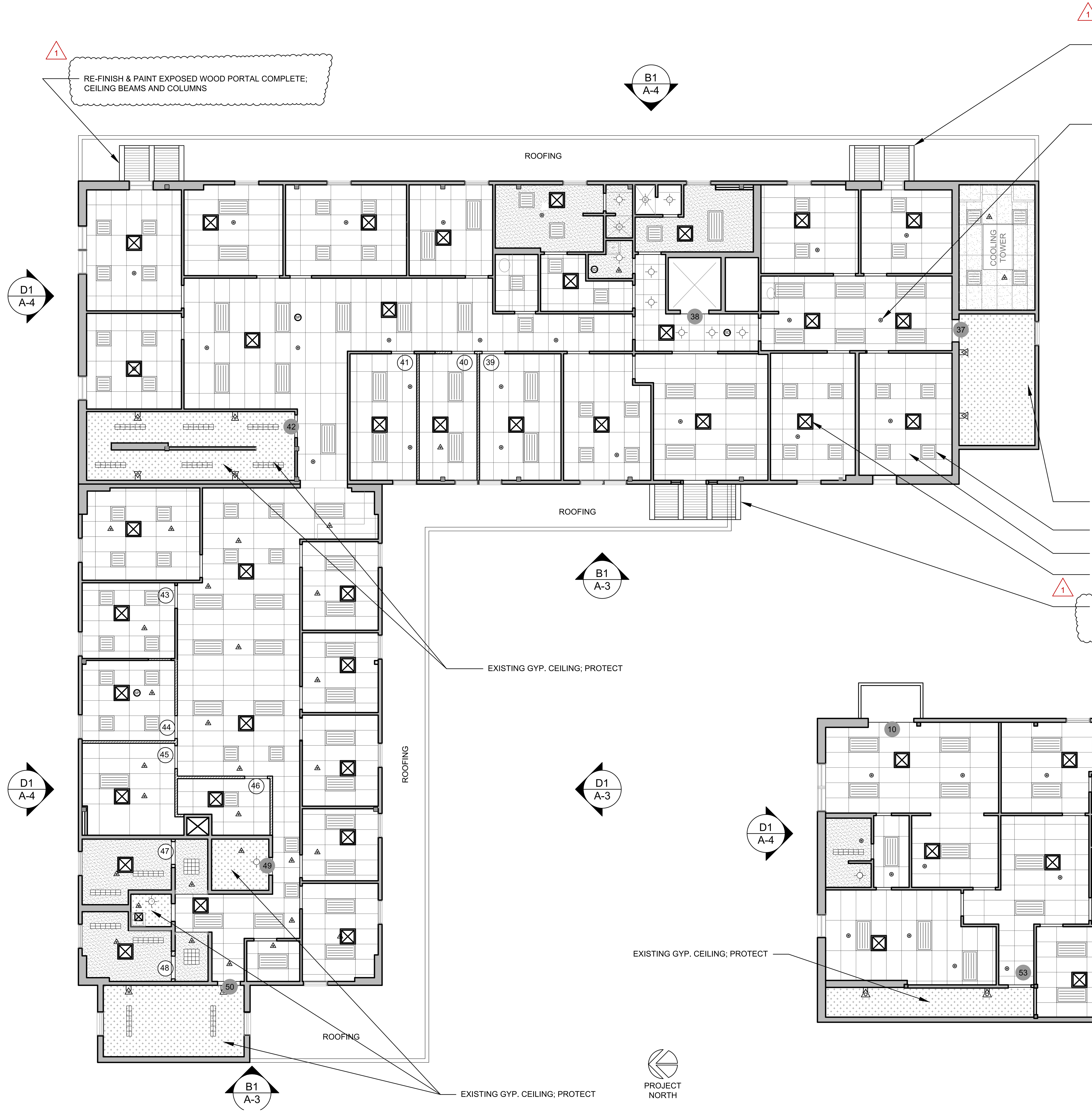
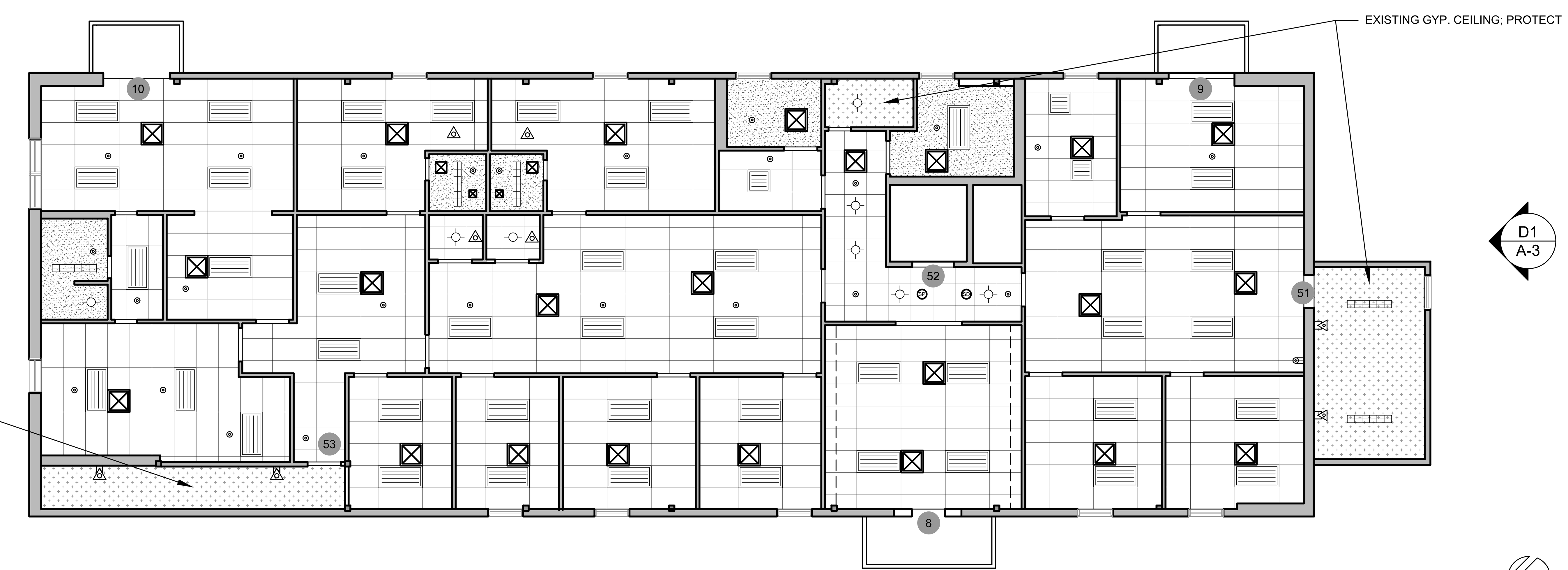
HVAC LEGEND

- NEW HVAC SUPPLY REGISTER
- NEW HVAC RETURN REGISTER
- NEW 12" x 12" CEILING EXTRACT FAN
- NEW 8" x 8" CEILING EXTRACT FAN



A1 SECOND FLOOR REFLECTED CEILING PLAN
1/8" = 1'-0"



A3 THIRD FLOOR REFLECTED CEILING PLAN
1/8" = 1'-0"

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Sheet Title: SECOND & THIRD FLOOR REFLECTED CEILING PLANS
Job Number: 2021-41
Sheet No. A-6

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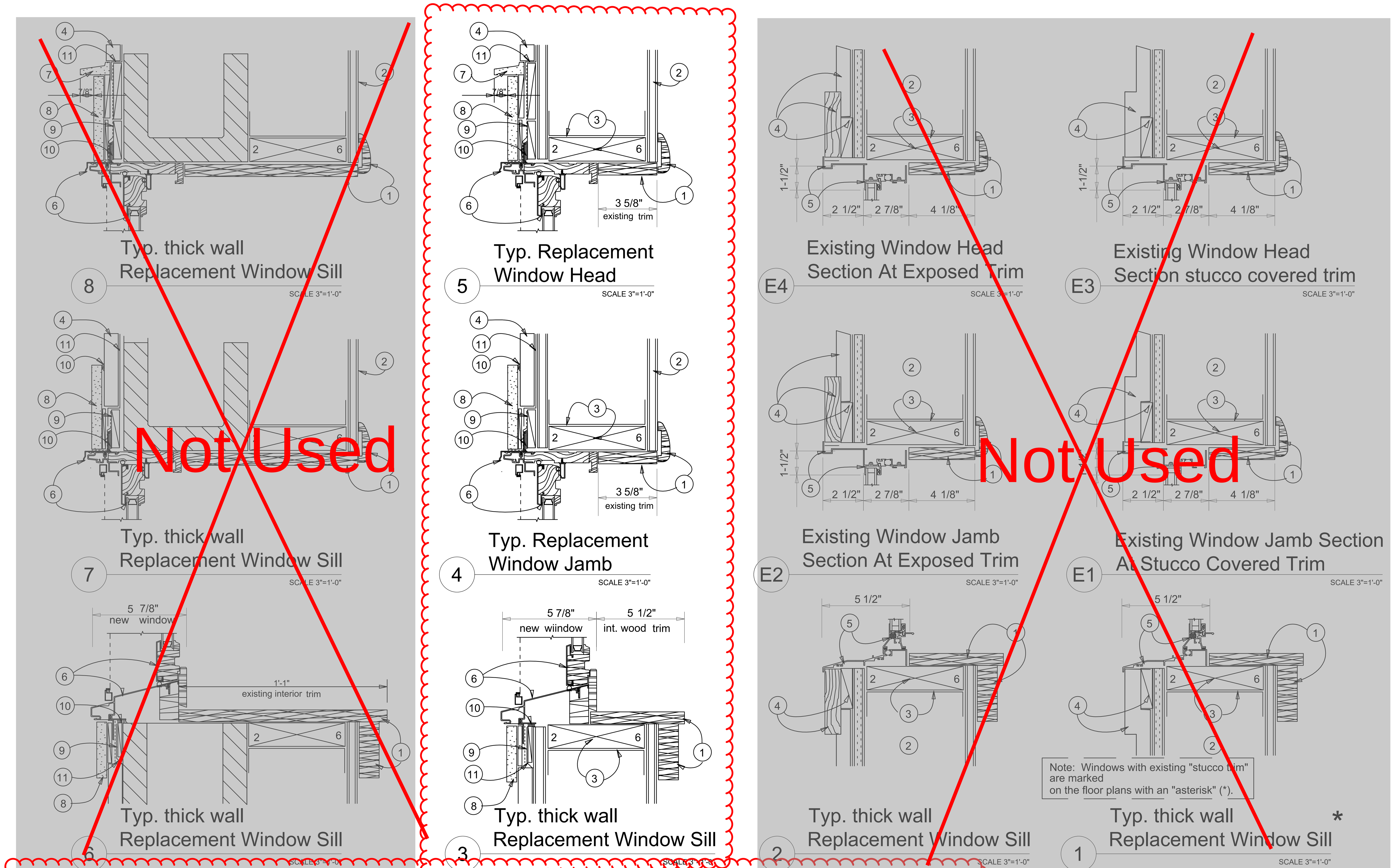
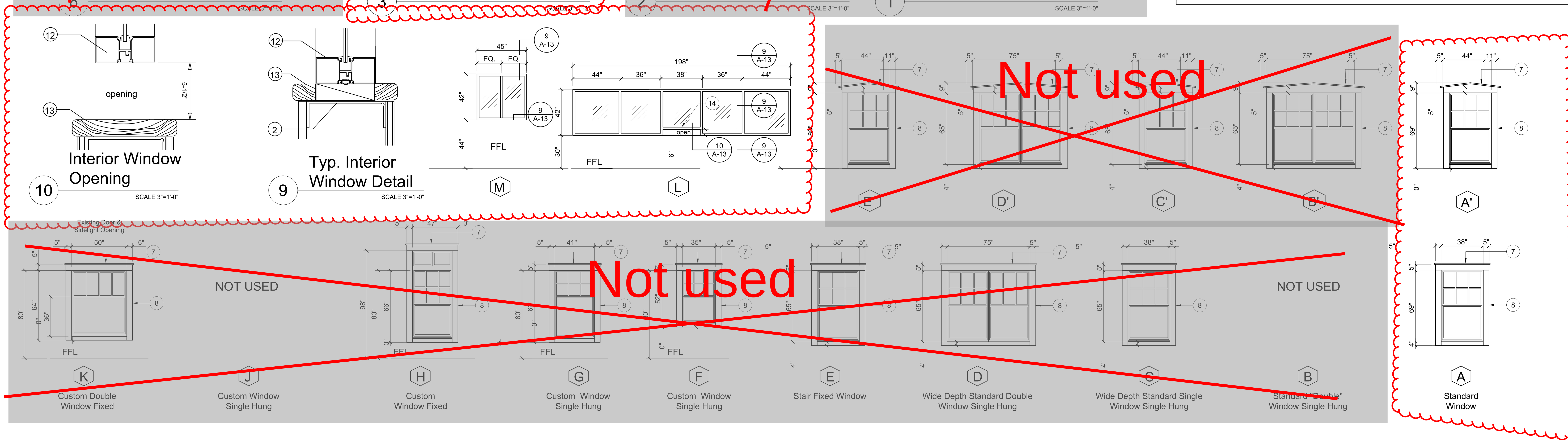


ALL DETAILS PART OF ADD ALTERNATE-B EXCEPT DETAILS 9 & 10 FOR INTERIOR WINDOW TYPES M & L WHICH ARE PART OF THE BASE BID



A1 WINDOW TYPES & DETAILS
1/4" = 1'-0"

GENERAL SHEET NOTES

A. WINDOW SCHEDULE DIMENSIONS SHOWN ARE FOR THE EXISTING WINDOW ROUGH OPENINGS (RO) THAT ARE NOMINAL AND SHALL BE VERIFIED WITH FIELD MEASUREMENTS FOR EACH WINDOW.

B. NEW WINDOWS ON THE 1ST LEVEL (GROUND FLOOR) SHALL BE "SINGLE HUNG" IN OPERATION WITH THE LOWER SASH FIXED IN PLACE AND THE UPPER SASH OPERATING AS A SINGLE HUNG WINDOW.

SHEET KEYED NOTES

1. EXISTING WOOD INTERIOR TRIM REMAINS. PROTECT, CLEAN AND REPLACE AS REQUIRED FOR WINDOW DEMOLITION AND RE-INSTALLATION. WINDWS HAVE VARIOUS INTERIOR TRIMS (DUE TO WALL THICKNESS) WHICH MAY REMAIN IN PLACE DURING WINDOW REPLACEMENT.
2. EXISTING GWB FRAME WALL REMAINS: PAINT GWB.
3. EXISTING 6" STEEL STUD FRAME WALL WITH 2X6 WINDOW FRAME OPENING REMAINS. SHIM AS NEEDED FOR NEW WINDOW.
4. REMOVE EXISTING STUCCO AND WOOD "TRIM" AROUND WINDOWS (WITH RELATED WOOD TRIM BELOW STUCCO) AND PREPARE FOR NEW WINDOW AND TRIM INSTALLATION. REFER TO ELEVATIONS FOR LOCATION OF THE EXISTING STUCCO TRIM OR THE EXISTING WOOD TRIM FOR DEMOLITION AND REMOVAL. EXISTING STUCCO: REMOVE TO ALLOW NEW WOOD TRIM INSTALLATION, BUT RETAIN EXISTING BUILDING PAPER LAYER (JUMBOTEX) TO LAP NEW VYCOR FLASHING.
5. REMOVE EXISTING WINDOW FOR NEW REPLACEMENT WINDOW. PROTECT OPENING DURING REPLACEMENT.
6. NEW WINDOW SECTION.
7. NEW PVC TRIM: DRIP CAP (MITER RETURN AT EACH END)
8. NEW PVC TRIM: 5/8" TRIM X WIDTH SHOWN IN WINDOW SCHEDULE
9. NEW "VYCORE" PEEL-AND-STICK MEMBRANE
10. NEW CONTINUOUS BEAD OF SEALANT
11. EXISTING BUILDING PAPER (JUMBOTEX): LAP "VYCORE" MEMBRANE
12. ALUMINUM STOREFRONT SYSTEM
13. 5/4" OAK TRIM EACH SIDE, EASE EXPOSED EDGES

14 STOREFRONT WITH PASS THROUGH AND SPEAKER HOLE.

SHEET LEGEND

GYPSUM WALL BOARD
EXTERIOR WALL SHEATHING
INTERIOR WOOD TRIM
STUCCO SYSTEM
EXISTING BUILDING PAPER (JUMBOTEX)
NEW "VYCORE" PEEL-AND-STICK MEMBRANE

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Job Number: 2021-41
Sheet No. A-12

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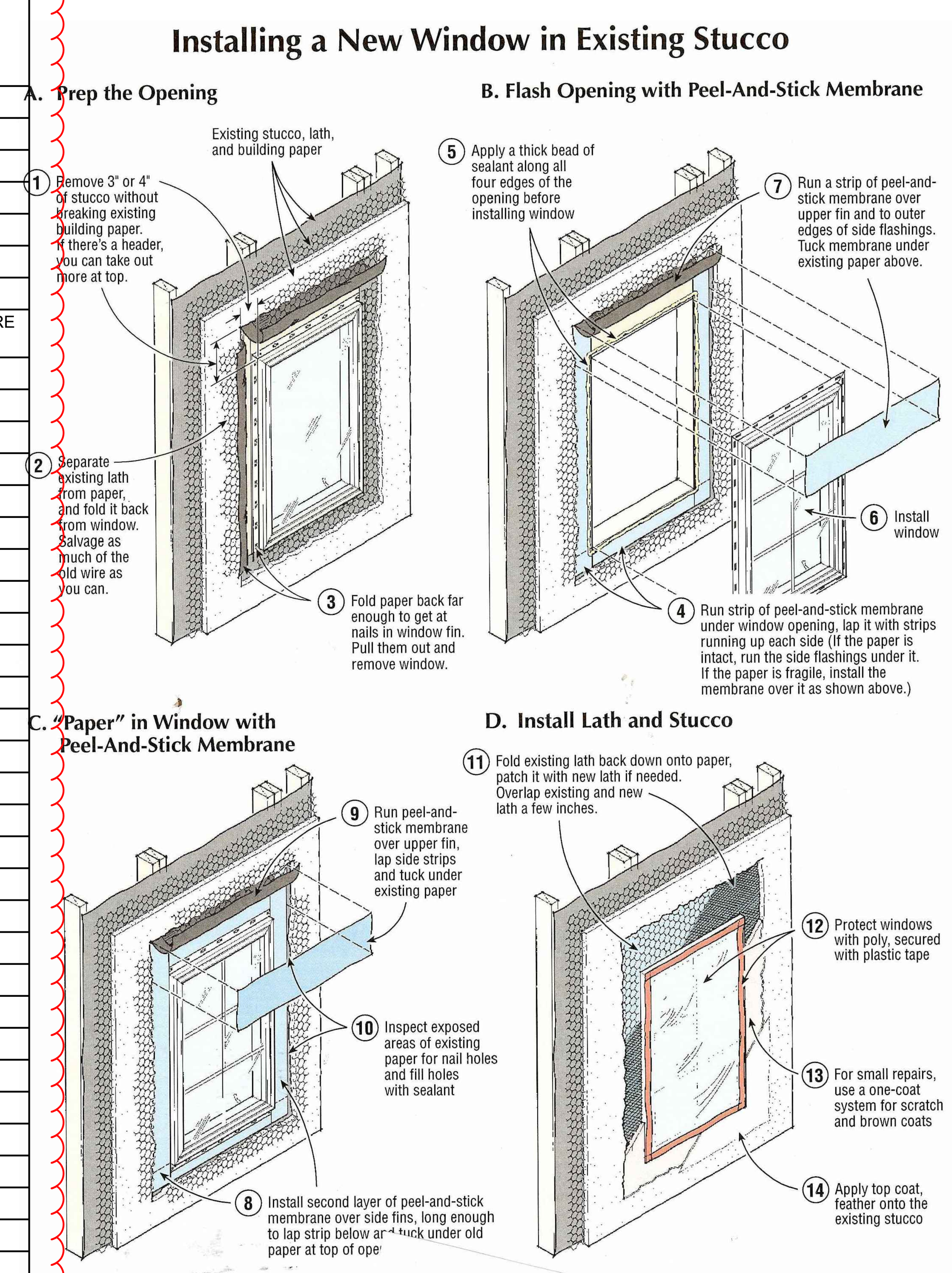
DOOR AND FRAME SCHEDULE

MARK	FLOOR LEVEL	DOOR TYPE	DOOR SIZE (NOMINAL) CLEAR WIDTH	DOOR SIZE (NOMINAL) HGT.	DOOR SIZE (NOMINAL) THK.	DOOR SWING	DOOR MTL	FRAME TYPE	FRAME MTL	FRAME DETAIL HEAD	FRAME DETAIL JAMB	FRAME DETAIL SILL	PROVIDE WIRELESS ACCESS LOCK	NOTES
1	1ST FLR	D1	6'-0"	7'-0"	1-3/4"	RHR-ACT	WD	F1	WD				NO	SALVAGED EXISTING EXTERIOR DOUBLE DOOR
2	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
3	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
4	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				NO	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
5	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
6	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
11	1ST FLR	D5	3'-0"	6'-1 1/2"	1-3/4"	RHR	STEEL	STEEL	STEEL				YES	
12	1ST FLR	EXISTING OR D5	EXISTING OR 3'-0"	EXISTING OR 6'-1 1/2"	EXISTING OR 1-3/4"	RHR	EXISTING OR STEEL	EXISTING OR F5	EXISTING OR STEEL				TBD	EXISTING OR SEE ADD ALTERNATE A (NEW STEEL GATE WITH NEW WIRE ACCESS LOCK SET)
13	1ST FLR	D5	3'-0"	6'-1 1/2"	1-3/4"	RHR	STEEL	STEEL	STEEL				YES	
14	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING ELEVATOR DOOR NEW WIRELESS ACCESS LOCK SET
15	1ST FLR	D4	5'-0"	7'-0"	1-3/4"	LHR-ACT	WD	F4	WD				NO	DOOR TO MOVEABLE PARTITION
16	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
17	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
18	1ST FLR	D3	3'-0"	7'-0"	1-3/4"	RH	WD	F6	ALUM.				NO	ALUMINUM FRAME ORIENTATION PER FLOOR PLAN
19	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F6	ALUM.				NO	ALUMINUM FRAME ORIENTATION PER FLOOR PLAN
20	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
21	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
22	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
23	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
24	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
26	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
27	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
28	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
29	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
30	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
31	1ST FLR	D3	3-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
32	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
33A	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
33B	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
34	1ST FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
35	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
36	1ST FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
37	2ND FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
38	2ND FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
39	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
40	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
41	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
42	2ND FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
43	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
44	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
45	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
46	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
47	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	RH	WD	F3	WD				NO	
48	2ND FLR	D3	3'-0"	7'-0"	1 3/4"	LH	WD	F3	WD				NO	
49	2ND FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
50	2ND FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
51	3RD FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
52	3RD FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
53	3RD FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
8	3RD FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
9	3RD FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET
10	3RD FLR	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING				YES	EXISTING DOOR & FRAME WITH NEW WIRELESS ACCESS LOCK SET

1

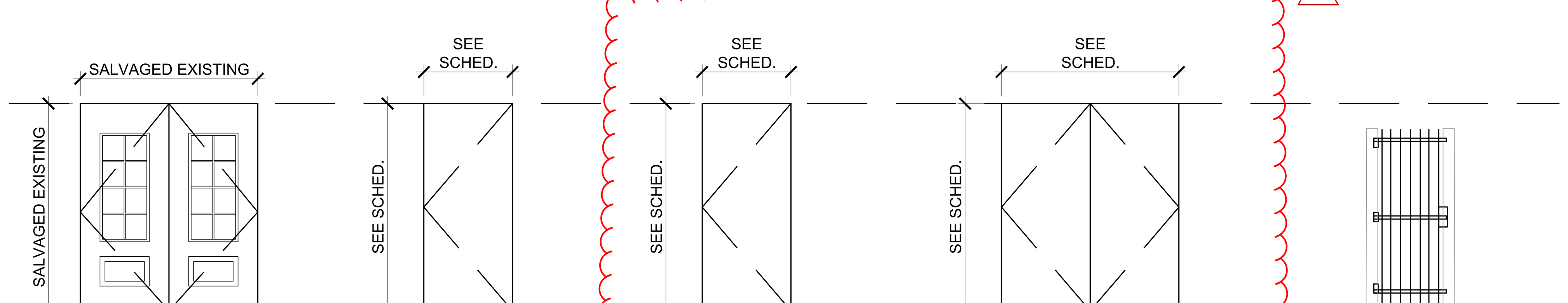


GENERAL SHEET NOTES

A. REPLACE OR REPAIR ALL HARDWARE AGAINST DEFECTS AS NOTED BELOW:
- LOCKSETS: 10 YEARS
- CLOSERS: 10 YEARS
- ALL OTHER HARDWARE: 2 YEARS.

B. ALL FRAME DIMENSIONS ARE NOMINAL AND SHALL BE BE VERIFIED BY CONTRACTOR.
C. ALL EXTERIOR GLAZING SHALL BE 1" THICK INSULATED, "1/4" SOLARBAN 70 ON SOLEXIA #2 - 1/4 CLEAR."
F. SEE PLANS FOR DOOR SWING DIRECTION.
G. MASTER KEY ALL LOCKSETS AND CYLINDERS AS DIRECTED BY OWNER.
H. SEE SHEET A-401 FOR CASEWORK.
I. ALL WINDOWS & DOORS REQUIRE SUBMITTALS BEFORE INSTALLATION WITH APPROVAL FROM ARCHITECT.
J. CONTROLLED ACCESS HARDWARE SHALL BE PROVIDED

1



D1
SALVAGED EXISTING EXTERIOR DOUBLE DOORS

D2
INTERIOR HOLLOW METAL DOOR; SHALL MATCH EXISTING HOLLOW METAL DOORS IN BUILDING

D3
INTERIOR SOLID CORE WOOD DOOR ; SHALL MATCH EXISTING WOOD DOORS IN BUILDING

D4
INTERIOR SOLID CORE WOOD DOOR; SHALL MATCH EXISTING WOOD DOORS IN BUILDING

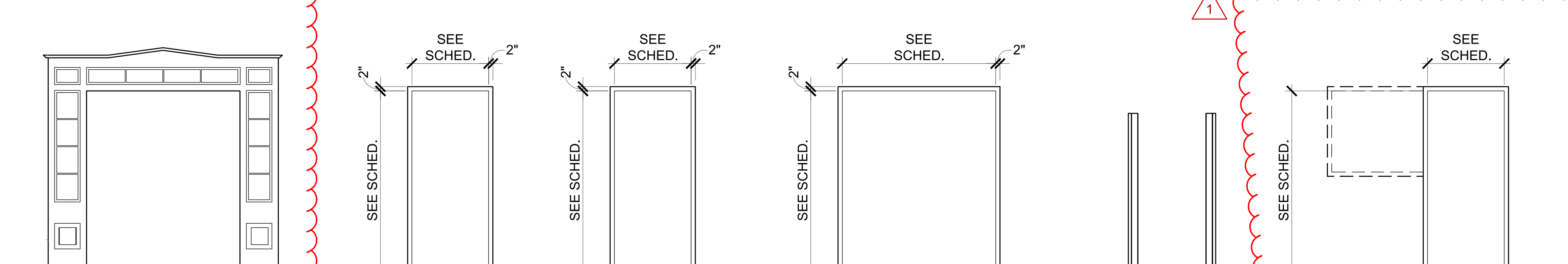
D5
EXTERIOR STEEL GATE; SEE SHEET C2/13; **ADD ALTERNATE A**

A1 DOOR TYPES

1/4" = 1'-0"

1

1



F1
NEW PAINTER FIR. EXTERIOR WOOD DOOR FRAME WITH SIDE LITES & MOLDING TO MATCH EXISTING

F2
HOLLOW METAL FRAME PAINTED

F3
WOOD FRAME FINISHED TO MATCH EXISTING

F4
WOOD FRAME FINISHED TO MATCH EXISTING

F5
STEEL FRAME ANCHORED TO CMU PILASTERS, EX. WALL OR ADJACENT STEEL FENCE; SEE SHEET C-2/13; **ADD ALTERNATE A**

F6
ALUMINUM STOREFRONT FRAME; SEE WINDOW TYPE M ON SHEET A-12

A3 DOOR FRAME TYPES

1/4" = 1'-0"

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1	Addendum-2	3/29/24
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Drawn by: KL
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Job Number: 2021-41
Sheet No. A-13

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SECTION 26 00 10 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Conform with applicable provisions of the General Provisions.

1.2 REQUIREMENTS

A. Furnish all labor, materials, service, equipment and appliances required to complete the installation of the complete electrical system in accordance with the specifications and contract drawings.

1.3 REQUIREMENTS OF REGULATORY AGENCIES AND STANDARDS

A. Regulatory Agencies: Installation, materials, equipment and workmanship shall conform to the applicable provisions of the 2017 National Electrical Code (NEC), the National Electrical Safety Code (NESC), and the terms and the conditions of the authorities having lawful jurisdiction pertaining to the work required. All modifications required by these codes, rules, regulations and authorities shall be made by the Contractor without additional charge to the Owner.

B. Underwriter's Laboratories (UL): All materials, appliances, equipment or devices shall conform to the applicable standards of Underwriter's Laboratories, Inc. The label of, or listing by, UL is required.

1.4 SUBMITTALS

A. Materials List: Within 15 days after award of contract, the Contractor shall submit to the Architect a minimum of 7 (seven) copies of all equipment to be furnished. Where such equipment will be furnished "as specified", a statement to that effect is sufficient. Where substitutions are proposed, the Contractor shall submit for prior approval. Written approval of the Architect must be obtained.

B. Samples: If required by the Architect, the Contractor shall submit for inspection samples of both specified and proposed substitute items.

C. Shop Drawings: Submit for approval a minimum of seven (7) copies of all shop drawings after the materials list has been approved and prior to ordering. Show complete outlines, dimensions, electrical services, control diagrams, electrical characteristics of special nature or critical to the installation and pertinent data required for installation. Indicate in the transmittal that submittal has been reviewed and accepted and all contract deviations identified.

PART 2 – PRODUCTS

2.1 EQUIPMENT REQUIREMENTS

A. The electrical requirements for equipment specified or indicated on the drawings are based on information available at the time of design. If equipment furnished for installation has electrical requirements other than indicated on the electrical drawings, the Contractor shall make all adjustments to wire and conduit size, controls, over current protection and installation as required to accommodate the equipment supplied, without additional charge to the Owner. The complete responsibility and costs for such adjustments shall be assigned to the respective section of this specification under which the equipment is furnished.

2.2 MATERIALS

A. All similar materials and equipment shall be the product of the same manufacturer.

B. Where no specific material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be used, providing it conforms to the contract requirements and meets the approval of the Architect.

C. Material and equipment shall be the standard products of manufacturers regularly engaged in the productions of such material and shall be the manufacturer's current and standard design.

D. Altitude: Equipment affected by altitude shall perform satisfactorily for the function intended at an altitude of the project site.

PART 3 - EXECUTION

3.1 GENERAL

A. Fabrication, erection and installation of the complete electrical system shall be done in a first class workmanlike manner by qualified personnel experienced in such work and shall proceed in an orderly manner so as not to hold up progress of the project. The Electrical Contractor shall check all areas and surfaces where electrical equipment material is to be installed, removed or relocated and report any unsatisfactory conditions before starting work. Commencement of work signifies this Contractor's acceptance of existing conditions. In the acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of workmen.

3.2 TEMPORARY POWER AND LIGHTING

A. Furnish and install all temporary electrical facilities required for construction and safety operations.

3.3 PERFORMANCE TESTS

A. Thoroughly test all fixtures, services and all circuits for proper operating condition and freedom from grounds and short circuits before acceptance is requested. All equipment, appliances, and devices shall be operated under load conditions.

3.4 AS-BUILT DRAWINGS

A. During progress of the work, maintain an accurate record of the installation of the system, locating each circuit precisely by dimension. Upon completion of the installation, transfer all record data to blue line prints of the original drawings.

3.5 OPERATING INSTRUCTIONS AND MANUALS

A. Instructions: Without additional charge to the Owner, furnish competent instruction to the Owner in the care, adjustment and operation of all parts of the electrical equipment and systems.

B. Manuals: Upon completion of the work, prepare and deliver to the Owner three (3) sets of complete operating and maintenance manuals for the systems and major equipment installed. Include catalog data, shop drawings, wiring diagrams, performance curves and rating data, spare parts lists and manufacturer's operating and maintenance data.

C. Other: The above requirements are in addition to specific instructions and manuals specified for individual systems or equipment.

3.6 DRAWINGS

A. General: The electrical drawings show the general arrangement of all conduit, equipment, etc. and shall be followed as closely as actual building construction and the work of other trades will permit. Because of the small scale of the electrical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, elbow, pullboxes, and accessories as may be required to meet such conditions.

B. Field Measurements: The Contractor shall verify the dimensions governing the electrical work at the building. No extra compensation shall be claimed or allowed on account of differences between actual dimensions and those indicated on the drawings.

3.7 LOCATION OF EQUIPMENT AND OUTLETS

A. The approximate locations of cabinets, panelboards, wiring, power outlets, etc., are indicated on the drawings; however, they are not intended to give complete and accurate information. Determine the exact location after thoroughly examining the general building plans and by actual measurements during construction, subject to the approval of the Architect.

3.8 ELECTRICAL INSTALLATIONS

A. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.

2. Verify all dimensions by field measurements.

3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.

7. Coordinate connection of electrical systems with existing utilities and services. Comply with other governing regulations.

8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.

9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other

installations.

11. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in other sections of these specifications.

12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.9 WARRANTY

A. Deliver originals of all guarantees and warranties on this portion of the work to the Owner. Warrant all equipment, materials and workmanship for one year in accordance with the terms of this Contract.

END OF SECTION 26 0010

SECTION 26 0519 – LOW VOLTAGE CONDUCTORS

PART 1 - GENERAL

1.1 CONFORMANCE

A. Conform with applicable provisions of the General Conditions, Special Provisions, and General Requirements.

1.2 RELATED WORK IN OTHER SECTIONS

A. Section 260010, General Provisions; Section 260526, Grounding.

PART 2 - PRODUCTS

2.1 WIRES AND CABLES (600 VOLTS)

A. Type: Conform to the applicable UL and IPCEA Standards for the use intended. Copper conductors with 600 volts insulation unless otherwise specified or noted on the drawings. Stranded conductors for No. 8 or larger where elsewhere specified or noted on the drawings.

B. Use of aluminum conductors will not be permitted.

C. Insulation: Type THHN insulation, 75 degrees C, for all conductors otherwise specified or noted on the drawings. 90 degrees C minimum insulation within fixture wireways of fluorescent fixtures. All control conductors shall be THHN stranded or MTW.

D. Size: No. 14 minimum for controls and No. 12 minimum for lighting and convenience outlets, etc. unless otherwise specified or noted on the drawings. Not less than NEC requirements for the system to be installed. If the equipment to be installed required larger conductor and conduit sizes than indicated on the drawings, the required changes shall be made without additional charge to the Owner.

E. Color Coding: Phase, neutral, and ground conductors color-coded in ac cordance with NEC. Connect all conductors of the same color to the same phase conductor. Color coding shall be A-black, B-red, C-blue, N-white, for 120/208 volts and A-brown, B-orange, C-yellow, N-off white for 277/480 volts, with green for all ground conductors. Conductors No. 14, 12 and 10 shall be solid color compounded for entire length.

2.2 CONNECTORS AND LUGS

A. For Copper Conductors No. 6 and Smaller: 3M Scotch-Lok or T & B Sta-Kon compression or indent type connectors with integral or separate insulating caps.

B. For Copper Conductors Larger than No. 6: Solderless, indent, hex screw or bolt type pressure conductors, properly taped or insulated.

2.3 TAPE

A. Plastic tape: 8.5 mils minimum thickness, 1,000,000 megohms minimum insulation resistance, oil resistant vinyl backing, oil resistant acrylic adhesive, incapable of supporting combustion per ASTM D-568 Test Method B.

PART 3 - EXECUTION

3.1 SPLICES

A. (480 Volts and Under): Conductor lengths shall be continuous from termination to termination without splices unless approved by the Owner.

3.2 PULL WIRES

A. In each empty conduit, except underground conduits, install a No. 14 galvanized steel pull wire or a plastic line having a tensile strength of not less than 200 pounds. In each empty underground conduit install a No. 10 AWG bare, hard drawn copper or copper clad pull wire or a plastic line having a tensile strength of no less than 200 pounds.

3.3 IN RACEWAYS

A. Install conductors in rigid conduit. EMT or flexible metallic conduit, unless otherwise specified or noted on the drawings.

3.4 CABLE BENDS

A. Radius of ends not less than 10 times the outer diameter of the cable.

3.5 BUNDLING

A. Conductors No. 10 and smaller shall be neatly and securely bundled and conductors larger than No. 10 shall be neatly and securely cabled in individual circuits, utilizing marlin twine, two ply lacing or nylon straps.

3.6 CONDUCTOR PULL

A. Conductors shall not be pulled into conduits until after all plastering or concrete work is completed and all conduits in which moisture has collected have been swabbed out.

3.7 CONNECTORS AND LUGS

A. Install with manufacturer's recommended tools and with the type and quantity of deformations recommended by manufacturer.

3.8 LABELING

A. All conductors and neutrals shall be tagged in every junction box and cabinet with wrap around, stick-on labels or pre-marked nylon clip sleeves identifying panel and circuit number.

END OF SECTION

SECTION 26 0526 - GROUNDING

PART 1 - GENERAL

1.1 RELATED WORK IN OTHER SECTIONS

A. Section 16010, General Provisions; Section 16110, Raceways, Boxes and Fittings; Section 16120, Conductors; Section 16133, Cabinets; Section 16140, Wiring Devices and Plates; Section 16160, Panelboards; Section 16170, Motor and Circuit Disconnects.

PART 2 - PRODUCTS

2.1 GROUNDING SYSTEM

A. Materials, equipment and devices related to the grounding system are specified under other sections of these specifications.

PART 3 - EXECUTION

3.1 GENERAL

A. Install two separate grounding systems: a service grounding system and an equipment grounding system. The service equipment, conduit systems, supports, cabinets, equipment, and neutral conductor shall be grounded in accordance with the minimum code requirements and as further indicated on the drawings or specified. Connect the two grounding systems together only at the main service equipment and at the secondary terminals of transformers creating separately derived distribution systems such as dry-type transformers.

3.2 SERVICE GROUNDING SYSTEM

A. General: The service grounding system is provided for the AC service neutral ground. Current return conductors, such as neutrals of the service entrance, feeder circuits and branch circuits, shall not be used for equipment grounding. Care must be exercised to insure that neutral bars are not bonded to the enclosures of panelboards, etc., which are not part of the main service equipment. Except for separately derived systems, the neutral conductors shall be grounded only in the main service equipment.

B. Common Ground Point: Establish one common ground point in the main service equipment by interconnecting the insulated neutral bus (or bar), the uninsulated equipment ground bus (or bar), and service grounding electrode conductor.

C. Neutral Disconnecting Means: Install a neutral disconnecting means in the main service equipment for disconnecting and isolating the neutral bus from the common ground. The disconnecting means may be disconnecting links in the interconnection between the insulated neutral and uninsulated equipment ground.

D. Neutral Bars: Provide an insulated neutral bar, separate from the uninsulated equipment ground bar, in all panelboards, transformers, starters, disconnect switches, cabinets, etc., which have neutral connections.

3.3 EQUIPMENT GROUNDING SYSTEM

A. General: Provide a complete equipment grounding system in accordance with the minimum code requirements and as further indicated on the drawings or specified. The equipment ground (green conductor) consists of metallic conditions to ground of non-current carrying metal parts of the wiring system or apparatus connected to the system. The primary purpose of equipment grounding is to provide greater safety by limiting the electrical potential between non-current carrying parts of the system to provide a low impedance path to ground for possible ground fault currents.

B. Common Ground Point: Establish one common ground point as specified elsewhere in this section of the specifications for interconnection of the equipment grounding system and the service grounding electrode conductor.

C. Service Equipment Enclosure: Bond the enclosure of the main service equipment to the uninsulated equipment ground bus (or bar) with a conductor or bar sized for 25% of the largest service overcurrent device.

D. Ground Bar: Provide an uninsulated equipment ground bar, separate from any insulated neutral bar, in all switchboards, panelboards, transformers, motor control centers, starters, disconnect switches, cabinets, etc., for grounding the enclosure and for connecting other equipment ground conductors. The ground bar shall be an integrally mounted and braced bus bar in switchboards or a separately mounted bar adequately braced or bolted at the enclosure of other types of equipment. The ground bar shall be adequately braced or bolted to the enclosure after thoroughly cleaning both surfaces to assure good contact. Provide solderless pressure connectors for all conductor terminations. Number and size of pressure connectors on equipment grounding bars as required for the termination of equipment grounding conductors. In addition to the active circuits, provide pressure connectors for all three-phase spares and spaces.

E. Conduits: Where metallic conduits terminate without mechanical connection to a metallic housing of electrical equipment by means of lock nut and bushings, provide ground bushing connected with a bare copper conductor to the ground bar in the electrical equipment. Metallic conduits containing ground wiring shall be bonded to the ground wire at both conduit entrance and exit. Install grounding conductor in each non metallic conduit or duct except those used for telephone, sound, or low-voltage signals and in all flexible conduit that does not have a built-in ground conductor. Bond the conductor at both ends to the equipment grounding system.

F. Feeders and Branch Circuits: Provide a separate green insulated equipment grounding conductor for each single or three-phase feeder and each branch circuit with a three-phase protective device. Provide a separate green insulated equipment grounding conductor for single phase branch circuits where indicated on the drawings. Install the required grounding conductor in the common conduit or raceway with the related phase and/or neutral conductors and connect to the box or cabinet grounding terminal. Where there are parallel feeders installed in more than one raceway, each raceway shall have a green insulated equipment ground conductor.

G. Devices: Install a minimum No. 12 green insulated equipment bonding conductor from a grounding terminal in the respective outlet or junction box to the green ground terminal of all receptacles and through flexible conduit to all light fixture housings.

H. Motors: Install a separate green insulated equipment bonding conductor from the equipment ground bar in the motor control center of separate starter through the conduit and flexible conduit to the ground terminal in the connection box mounted on the motor. Install the grounding conductor in the common conduit or raceway with the related motor circuit conductors.

3.4 SEPARATELY DERIVED SYSTEMS

A. Transformers creating separately derived distribution systems, such as dry-type transformers, shall utilize the equipment ground bars in the transformer enclosure for both secondary equipment ground and secondary neutral ground with separate grounding conductor extended to an approved ground electrode.

3.5 GROUNDING ELECTRODES

A. The service ground electrodes shall be utilized. One shall be the main cold water metallic water piping system and the other shall be a made electrode consisting of not less than twenty feet of bare copper conductor encased along the bottom of a concrete foundation footing which is in direct contact with the earth (NEC 250-83a). Make the connections to the cold water pipe inside the building at the point of entrance. The grounding electrode for separately derived systems shall be approved for this application.

3.6 GROUNDING CONDUCTORS

A. The grounding conductors for both service ground electrodes shall be insulated or bare copper, sized in accordance with NEC 250-94(a), including the conductor for the made electrode. The conductors shall be continuous without joint or splice and shall be installed in conduit with the conduit bonded to the conductor at each end. Install the conductor to permit the shortest and most direct path and terminate in the main service equipment on the common ground point. Equipment grounding conductors shall be green insulated conductors equivalent to the insulation on the associated phase conductor, but not less than Type TW. The equipment grounding conductor or straps shall be sized in accordance with NEC. Where one feeder serves a series of panelboards or transformers, the equipment grounding conductor shall be continuous without splices. Grounding conductors shall not be installed through metal-sheathed holes. All connections shall be available for inspection and maintenance.

3.7 GROUND CONNECTIONS

A. Clean surfaces thoroughly before applying ground lugs or clamps. If surface is coated the coating must be removed down to the bare metal. After the coating has been removed, apply a non-corrosive approved compound to cleaned surface and install lugs or clamps. Where galvanizing is removed from metal, it shall be painted or touched up with "Galvanox", or equal.

3.8 TESTS

A. Test the completed grounding system with a meggar at the service ground bar and submit a written report to the Architect for approval. The service shall not be energized if the test shows more than 5 ohms, unless approved by the Engineer.

END OF SECTION 26 0526

SECTION 26 0533 - RACEWAYS, BOXES, AND FITTINGS

PART 1 - GENERAL

1.1 CONFORMANCE

A. Conform with applicable provisions of the General Conditions, Special Provisions and General Requirements.

1.2 RELATED WORK IN OTHER SECTIONS

A. Section 26 00 10, General Provisions; Section 26 05 26, Grounding.

PART 2 - PRODUCTS

2.1 CONDUITS

A. Steel Conduit: Rigid, threaded, thick wall, zinc coated on the outside and either zinc coated or coated with an approved corrosion resistant coating on the inside.

B. Electrical Metallic Tubing (EMT): Mild steel, zinc coated on the outside and either zinc coated or coated with an approved corrosion resistant coating on the inside. Maximum, size 2 inch electrical trade size unless noted on the drawings or specifically approved.

C. Intermediate Metal Conduit (IMC): Rigid, threaded, lightweight steel, zinc-coated on the outside and either zinc-coated or coated with an approved corrosion resistant coating on the inside.

D. Flexible Conduit: Commercial greenfield, galvanized steel, with a separate grounding bond wire installed in the conduit in addition to other wires.

E. Liquid Tight Flexible Conduit: Flexible galvanized steel tubing with extruded liquid tight PVC outer jacket and a continuous copper bonding conductor wound spirally between the convolutions. Where a separate grounding conductor is installed in the conduit, bonding conductor in the convolutions may be omitted.

F. Plastic coated rigid steel conduit shall be hot galvanized steel conduit with a coating of polyvinyl chloride, minimum 15 mills (0.015), on the exterior surfaces, shall have an approved corrosion resistant coat inside and shall be Pittsburgh, J & L, Republic or approved equal.

G. Rigid Non-Metallic Conduit: Schedule 40, high impact PVC with 7,000 psi tensile strength at 73.4 F., 11,000 psi flexural strength, 8,600 psi compression strength, approved for 90 C. conductors. Carlon, Triangle, or approved equal.

H. Aluminum Conduit: Rigid, threaded, thick wall type, approved for the application.

I. Conduit Size: Minimum conduit size 1/2 inch except where specifically approved for equipment connections. Sizes not noted on drawings shall be as required by the NEC. All home runs to panel shall be 3/4 inch minimum. Conduits for #12 THHN wire shall be sized the same as for #12 TW wire.

2.2 CONDUIT FITTINGS

A. Connectors and Couplings: Compression type threadless fittings for rigid steel conduit or IMC not permitted. Set screw type fittings for rigid aluminum conduit not permitted. EMT couplings and connectors either steel or malleable iron only. "Concrete Tight" or "Rain Tight" and either the gland and ring compression type or the stainless steel multiple point locking type. Connectors to have insulated throats. EMT fittings using set screws or indentations as a means of attachment are not permitted.

B. Bushings: Insulated type, designed to prevent abrasion of wires without impairing the continuity of the conduit grounding system, for rigid steel conduit, IMC and rigid aluminum conduit larger than 1/2 inch size and connectors for EMT.

C. Rigid Steel Conduit, IMC and EMT Fittings: Iron or steel only.

D. Liquid Tight Flexible Conduit Fittings: With threaded grounding cone, a steel, nylon or equal plastic compression ring and a gland for tightening. Either steel or malleable iron only with insulated throats and male thread and locknut or male bushing with or without "O" ring seat. Each connector shall provide a low resistance ground connection between the flexible conduit and the outlet box, conduit or other equipment to which it is connected.

E. Rigid Aluminum Conduit Fittings: Malleable iron, steel or aluminum alloy. Ferrous fittings zinc coated or cadmium plated. Aluminum alloy fittings shall conform with the characteristics defined by UL for aluminum rigid metallic conduit and shall not contain more than 0.04 percent copper.

F. Flexible Conduit Fittings (Commercial Greenfield): Either steel or malleable iron only, with insulated throats.

G. Fittings for PVC Coated Rigid Steel Conduit: Ells and couplings used with PVC coated rigid steel conduit shall have a factory applied coating of polyvinyl chloride, minimum 15 mills (0.015) on exterior surfaces and shall have a PVC sleeve extruded a minimum of 2" from one end of the fitting.

2.3 OUTLET BOXES

A. Construction: Zinc coated or cadmium plated steel boxes of a class to satisfy the condition at each outlet except where unilet on condulet bodies are required. Knockout type with knockouts removed only where necessary to accommodate the conduit entering. Square cornered, straight sided gang boxes, 4 inch octagon concrete rings and 4 inch octagon hung ceiling boxes with bars may be folded type, one piece deep drawn type for all other boxes.

B. Size: To accommodate the required number and sizes of conduits, wires and splices in accordance with NEC requirements, but not smaller than size shown or specified. Standard concrete type boxes not to exceed 6 inches deep except where necessary to permit entrance of conduits into side of boxes without interference with reinforcing bars. Special purpose boxes shall be sized for the device or application indicated.

2.4 PULLBOXES

A. Minimum NEC requirements unless larger box is noted. As specified for outlet boxes with blank cover for pullboxes with internal volume not more that 150 cubic inches. As specified for cabinets for pullboxes with internal volume over 150 cubic inches, except covers to have same thickness as box with corrosion resistant screw or bolt attachment.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATIONS

A. Conduit Systems: Rigid Steel conduit, IMC, EMT, or Rigid Non-Metallic conduit unless noted. Install steel conduits for underground runs, runs in concrete feeder circuits and where required by the NEC for mechanical protection, etc. Use flexible conduit only for motor or equipment connections and then only to the extent of minimum lengths required for connections. Install flexible conduit connections at all resilient mounted equipment. Provide liquid tight flexible conduit in exterior, wet or damp locations and for connections to the pipe mechanical system. Aluminum conduit may be used only in dry locations above ground in sizes two inch or larger for power and communications systems. Conduit and tubing shall be kept at least 6 inches from paralleled runs or hot water or steam pipes.

B. Conduit Installation: Install concealed conduit and EMT in as direct lines as possible. Install exposed conduits and EMT parallel to or at right angles to the lines of the building. Right angle bends in exposed conduit and EMT runs shall be made with standard elbows, screw jointed conduit fittings or conduit bent to radius no less than those of standard elbows.

C. Concealed Conduits: Install conduit systems concealed where possible unless otherwise noted. Conduit systems may be exposed in unfinished utility areas, ceiling cavities and where specifically approved by the Architect.

D. Conduit in Concrete: Conduits shall not be installed in floor slabs poured on grade. Rigid steel conduit may be embedded in above grade concrete providing the outside diameter does not exceed 1/3 thickness of concrete slab, wall or beam, is located entirely within the center third of the member and lateral spacing of conduits is not less than 3 diameters. Aluminum conduit shall not be embedded in concrete or masonry.

E. Conduit in Ground: PVC plastic coated rigid steel conduit shall be installed for all underground feeders and in all locations where conduit is in contact with dirt, soil, fill or earth. All fittings, couplings, ells, etc., used with conduit shall have same factory applied PC coating.

1. At his option, Contractor may substitute Schedule 40 rigid non-metallic conduit for PVC plastic coated rigid steel conduit, where allowed by the Code enforcing Authority. Installations and use of rigid non-metallic conduit shall comply with the NEC. An equipment grounding conductor, in accordance with NEC, shall be installed in all non-metallic conduits. All conduit sizes, shown on the plans, shall be increased to accommodate the installation of the equipment grounding conductor. All joints shall be made with solvent cement per manufacturer's recommendations and shall be watertight. Plastic conduit runs stubbing up to above grade junction boxes or conduit by installing a female adapter, 90 degree PVC coated rigid steel elbow and a PVC coated rigid steel nipple of length as required to stub conduit up. No plastic conduit shall be installed above grade. <u>Plastic conduit shall be used for straight runs only. PVC coated rigid steel conduit shall be used for all bends, ells and offsets.</u>

F. Conduit Bends: In any conduit or EMT run, the number of quarter bends or equivalent between terminations at cabinets or boxes shall not exceed four bends for conduits up to 1 1/4 inch, three bends for 1 1/2 to 2 1/2 inch conduits and two bends for 3 to 4 inch conduits. Conduit runs between cabinets or boxes shall not exceed 200 feet for straight runs nor 100 feet for runs with maximum number of bends. Bends in telephone feeder conduits shall be long radius.

G. Conduit Openings: Protect all vertical runs of conduits or EMT terminating in the bottoms of boxes or cabinets, etc., from the entrance of foreign material prior to installation of conductors.

H. Sleeves for Conduit: Install sleeves for conduit where shown or as required. Conduit sleeves not used shall be plugged with recessed type plugs. Sleeve all conduit passing through walls. Sleeves that are used shall be caulked tight with lead yarn.

3.2 CONDUIT SUPPORTS

A. Supports: Provide supports for horizontal conduits and EMT not more than 8 feet apart with not less than two supports for each 10 foot straight length and one support near each elbow or bend including runs above suspended ceilings and within 3 feet of all junction boxes, switches, fittings, etc.

B. Strap: Install one hole pipe straps on conduits 1 1/2 inch or smaller. Install individual pipe hangers for conduits larger that 1 1/2 inch. Spring steel fasteners with hanger rods may be used in dry locations in lieu of pipe straps.

C. Trapezes: Install multiple (trapeze) pipe hangers where two or more horizontal conduits or EMT run parallel and at the same elevation. Secure each conduit or EMT to the horizontal hanger member by a U-bolt, one hole strap or other specially designed and approved fastener.

D. Hanger Rods: Install 1/4 inch diameter or larger galvanized steel rods for trapezes, spring steel fasteners, clips or clamps. Wire or perforated strapping shall not be used for the support of any conduit or EMT.

E. Fastening: Fasten pipe straps and hanger rods to concrete by means of inserts or expansion bolts to brickwork by means of expansion bolts and to hollow masonry by means of toggle bolts. Wooden plugs and shield shall not be used. Power driven fasteners may be used to attach pipe straps and hanger rods to concrete only where approved by the Architect.

F. All conduits not embedded in concrete shall be firmly secured by means of pipe clamps, hangers, etc., equal to Caddy fasteners of ERICO Prodicts, Inc. Wire wrapped around conduits and supporting members will not be accepted.

3.3 CONDUIT STUB-UPS

A. All conduits run under floor shall be stubbed up to a coupling set flush with floor. This includes conduits stubbed up in walls and feeder conduits. Install flush plug until after floor is finished, then complete connections to boxes or equipment.

3.4 OUTLET BOXES

A. Outlet boxes, covers and fittings, according to the particular use for which they are required, shall be provided in the locations marked on the drawings by symbols, and/or for use to facilitate the installation of the electrical systems. When necessary, outlets shall be relocated so that where fixtures of other fittings are installed they will be symmetrically located according to the room layout and will not interfere with other work or equipment required by the drawings and these specifications.

B. Installation: Unless otherwise specified or shown on the drawings, outlet boxes shall be flush mounted and the front edges of the boxes or plaster covers shall be flush with the finished wall or ceiling line or if installed in walls and ceilings of incombustible construction, not more than 1/4 inch back of same. Mount boxes with the long axes of devices vertical, unless otherwise specified. Boxes in plastered walls and ceilings shall be provided with plastic covers. A multiple of box extensions and/or covers will not be permitted. Install in a rigid and satisfactory manner with suitable metal bar hangers, box cleats, adjustable box hangers, etc. Use wood screws on wood, expansion shields on masonry and machine screws on steel work.

3.5 PULLBOXES

A. Provide additional pullboxes wherever necessary to meet requirements for maximum length of conduit runs and maximum numbers of bends as specified under "Conduit and Fittings".

3.7 FIXTURE CONNECTIONS

A. Recessed or surface light fixtures in lay-in or accessible ceilings shall be connected with minimum 1/2 inch flexible metallic conduit, 4 to 6 feet long with grounding provisions.

3.8 CLOSING OF OPENINGS

A. Wherever slots, sleeves, or other openings are provided in floors or walls for the passage of conduits or other forms of raceway, such openings, if unused, or the spaces left in such openings, shall be filled or closed in a manner approved by the Architect.

END OF SECTION

SECTION 26 2416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED WORK IN OTHER SECTIONS

A. Section 26 0010, General Electrical Requirements; Section 26 0526, Grounding.

1.2 SUBMITTALS

A. Submit complete shop drawings with outline dimensions, descriptive literature and complete descriptions of the frame size, trip setting, class and interrupting rating of all overcurrent devices. Identify available space.

PART 2 - PRODUCTS

2.1 GENERAL

A. Dead front, safety type with voltage ratings as scheduled. Panelboards shall be of the type required for the short circuit and duty ratings indicated on the drawings or specified. All panelboards shall have a neutral bus and a ground bus. Panelboards shall be circuit breaker as scheduled, unless otherwise noted. Apartment unit panels shall be load center type construction. Community Building and House panels shall be bolt-in circuit breaker type construction.

2.2 CABINETS

A. Each panelboard shall be enclosed in a single sheet metal cabinet with front doors, catches, locks, etc.

B. Door-In-Door: Both surface and flush panels shall be door-in-door. The door over the interior of the panel shall be provided with hinges and combined lock and latch. The outside door over the panel gutters shall have a hinge on one side and machine screws into threaded holes in the panelboard cabinet on the other three sides. In order to insure the rigidity of the outside door, surface type panels shall have a 1/2 inch deep lip bent over all around with the corners welded and ground; or, in the case of flush panels a steel angle frame equivalent in strength to the bent-over lip, shall be welded to the inside of the door. The outside door shall be of such size as to allow a minimum of 2 3/4 inches opening to all four sides of the wiring gutter. All locks shall be keyed alike.

2.3 BRANCH CIRCUIT PANELS

A. All branch circuit panels for lighting and single phase loads shall be "Quick-lag" circuit breakers with 10,000 amps interrupting capacity, main lugs or main breaker as indicated on the drawings, "Door-In-Door" cover. Circuit breakers providing motor short circuit protection shall have trip elements sized to meet NEC requirements or equipment manufacturer's recommendations, whichever are smaller.

B. Breakers: Molded case as scheduled or required. Provide quick make and quick break toggle mechanism, inverse time trip characteristics and trip free operation on overload or short circuit. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Provide trip ratings as indicated in the panelboard schedules. Adjustable magnetic trip devices shall be set at the factory to the low trip setting. Provide breaker frame sizes as required for the continuous rating or the interrupting capacity, whichever is larger.

C. Bolted Type: Circuit breaker current carrying connections to the bus shall be of the bolted type, factory assembled. Stab in type not permitted. Provide bus bars for three phase panelboards of the sequence phased type connection and arranged for 3 phase, 4 wire mains, unless otherwise indicated on the drawings.

D. Space Only: Where "space only" is noted on the drawings, provide necessary connectors, mounting brackets, etc., for the future insertion of an overcurrent device. Spaces shall be sized for 100 amp straps minimum. The word "space" is intended to mean a space for a future branch circuit breaker, and will include connection straps rated at 100 amperes, minimum, holding brackets, and an identifying numbering unit, so that all that is necessary to convert it to an active circuit is installation of the circuit breaker.

E. Directories: Provide typewritten circuit descriptions referencing permanent room numbering assigned in lieu of the room numbering shown on the drawings.

F. Labels:

1. Labels for identifying the breaker shall be engraved laminated plastic strips attached by screws or phenolic buttons or small window frame type.

2. Labels for identifying the panel shall be engraved laminated plastic attached by screws. The nameplate shall identify the panel by name or designation, the voltage system, number of phases, number of wires, and the location of the overcurrent protective device (e.g. "PANEL LW - 120/208V, 3PH, 4W FED FROM MDS-2". Lettering shall be minimum 2" high white letters on black background.

G. Skirts: Where noted on the drawings panelboards shall be skirted with complete metal enclosures and barriers separating the panel interior.

2.4 BUS BARS

A. All bus bars shall be copper. Use of aluminum bus bars will not be permitted.

2.5 SPARE CONDUITS

A. Provide a minimum of five (5) 1"C stubbed from each branch circuit lighting and appliance panel to the closest accessible lay-in ceiling area, for future branch circuit wiring. The total number of spare conduits shall be determined by one (1) 1"C for every three (3) spare 20A/1P circuit breaker in the panel. All spare conduits shall be stubbed, capped, and labeled as "spare conduit". Refer to the plans for additional spare conduits.

PART 3 - EXECUTION

3.1 CIRCUIT NUMBERING

A. Circuit numbering shown on the drawings is based on pole position in the panelboard and not consecutive numbering.

3.2 PHASE ROTATION

A. Phase A, left bus; phase B, center bus; phase C, right bus (front viewing).

3.3 CABLE TIE-WRAPPING AND TRAINING

A. All branch circuit conductors within the panelboard shall be neatly tie-wrapped and trained - no exceptions. Utilize nylon cable wraps and group branch circuit conductors towards the rear of the panel interior. Other means of tie-wrapping branch circuit conductors will not be accepted (wire, string, or conductors).

B. Label all branch circuits at the point of entry into the panelboard. Labels shall be nylon clip-on sleeve and shall identify the branch circuit conductor by the panelboard circuit number.

3.4 CLEANING

A. All panel interiors shall be cleaned of dirt and debris prior to energizing the panels.

B. Clean all exposed panel surfaces of dirt and paint. Touch-up all scratches with matching paint.

END OF SECTION

SECTION 26 2726 - WIRING DEVICES AND PLATES

PART 1 - GENERAL

1.1 RELATED WORK IN OTHER SECTIONS

A. Section 26 0010 General Provisions; Section 26 0526, Grounding.

PART 2 - PRODUCTS

2.1 SNAP SWITCHES

A. Unless otherwise specified, each snap switch (flush tumbler-toggle) shall be of the A.C. General use type for mounting in a single gang spacing, fully rated 20 amperes minimum at 120/277 volts, conforming to minimum requirements of the latest revision of the Underwriter's Laboratories, Inc., UL 20 Fifth Edition Standard Snap Switches and further requirements herein specified. Specification grade, heavy duty, single pole, 3-way or 4-way, of the maintained, momentary or lock type as indicated on the drawings. Ivory color handles unless otherwise indicated on the drawings. Silver or silver alloy contacts. A.C. 120/277 volt general use snap switches shall be capable of withstanding tests as outlined in NEMA Publications and shall be as follows unless otherwise noted.

20A 120/277 AC	HUBBELL
1P	1221-I
3-WAY	1223-I
4-WAY	1224-I

2.2 RECEPTACLES

A. General: Configuration and requirements for all connector or outlet receptacles shall be in accordance with NEMA Publications. Fire resistant, non-absorptive, hot welded, phenolic composition, Hospital Grade, or equal bodies and bases with metal plaster ears (integral with the supporting member). Single or duplex as shown or noted on drawings. Ivory color unless otherwise noted on the drawings. Double grip contacts for each prong.

B. Grounding Type: All receptacles shall be grounding type with a green colored hexagonal equipment ground screw of adequate size to accommodate an insulated grounding jumper
(based on Table 250-95 of the NEC with minimum size No. 14 AWG). Grounding terminals of all receptacles shall be internally connected to the receptacle mounting yoke.

C. Unless otherwise noted, receptacle shall be as follows:

DEVICE	HUBBELL
20A-125V AC 2P 3W	8300WH-I

D. Special: Receptacles for special applications shall be as indicated on the drawings.

2.3 DEVICE PLATES

A. General: Provide plates for each switch, receptacle, signal and telephone outlet and special purpose outlet. Plates shall be stainless steel unless otherwise noted. Do not use sectional gang plates.

B. Exposed: Plates for exposed screw jointed fittings shall match the fittings with edges of plates flush with edges of fittings. Heavy cadmium plates, steel with gasket. Plates for cast type boxes at locations subject to set or rain conditions shall be of the cast, vapor tight type. Provides hinged covers for devices.

C. Communications: Plates for telephone and signal outlets shall each have a 3/8 inch bushed opening in the center. Wall plates for push button and buzzer outlets shall have openings to suit the push buttons and buzzers.

PART 3 - EXECUTION

3.1 DEVICE PLATES

A. Install with alignment tolerance of one-sixteenth inch and all edges in continuous contact with wall surfaces.

END OF SECTION

SECTION 265113 - LIGHTING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED WORK IN OTHER SECTIONS

A. Section 26 0010, General Electrical Requirements; Section 26 0526, Grounding.

1.2 SUBMITTALS

A. Submit for approval complete shop drawings, catalog cuts, special installation instructions, photometric data and descriptive literature. When fixtures are proposed for substitution and prior approval has not been issued, the submittal for approval shall include catalog cuts of both the specified and proposed fixtures.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish all lighting fixtures throughout the type indicated on the drawings, complete with lamps, sockets, wiring, fitters, hangers, plaster rings, canopies, etc., as required.

2.2 LED Fixtures

A. Fixtures shall be LED type as indicated in the Fixture Schedule.

2.3 FINISH

A. Bonderized or equal treatment on all steel parts prior to applying finish. Metal parts shall be aluminum, brass, copper, bronze, or steel, with baked white enamel finish unless otherwise noted on the drawings.

2.4 CEILING TRIM

A. Furnish proper ceiling frames for the ceiling material in which recessed fixtures are to be installed.

2.5 LENS

A. When acrylic lens or diffuser is specified, it shall be molded of 100% acrylic meeting American Society for Testing Materials specifications for Methacrylate Molding and Extrusion Compounds (ASTM D788-63). Plastic diffusing panels, luminous side panels and other luminous plastic members of fixtures shall be made of not less than .125 inch thick prismatic clear acrylic material. Plastic shall be non-flammable or shall have a flame spread rate of not more than 3.2 inches per minutes for a 1/2 inch width of the material. The plastic shall be non-electrostatic or the finished parts shall be treated with an anti-static wax.

2.6 HOUSING

A. Not less than 20 gauge steel with baked white enamel finish applied over corrosion-resistant primer unless otherwise specifically approved.

2.7 EXIT LIGHTS

A. Exit lights shall be constructed of die cast high strength aluminum construction, with removable snapouts provided in the stencil fact casting to allow for right, left, or double directional arrows. Exit stencil letter shall beet UL 924 requirements for height, width, stroke and minimum spacing. Exit lights shall be white in color with brushed aluminum stencil face.

B. Exit lights shall be supplied with lamp panels which consume less than .5 watt per face, and shall meet or exceed UL 924 requirements for exit face illumination and contrast ratio. Lamps shall be compact fluorescent as indicated on the fixture schedule.

PART 3 - EXECUTION

3.1 SUPPORTS

A. Support ceiling fixtures by anchorage to the ceiling only where the ceiling is concrete or masonry units. For ceilings of other construction, anchor ceiling fixtures to metal supports provided for that purpose of suitable strength and stability, adequately attached to and supported by joists, trusses, or other structural members, unless other methods of support are specifically approved by the Architect. Lay-in fixtures shall be supported independently of the ceiling support system.

3.2 CEILING TRIM AND MEANS OF SUPPORT

A. The ceiling trim and means of support of recessed fixtures shall be coordinated with the type of the ceiling to be installed to insure proper installation.

3.3 SUSPENDED FIXTURES

A. Provide swivel hangers to insure a plumb installation. For single unit suspended fluorescent fixtures provide tubings or stems for wiring at one point and a tubing or rod suspension provided for each unit of chassis. Provide 3/16 inch diameter rods minimum.

3.4 BLOCKING

A. Protect housing of recessed lighting fixtures during installation by internal blocking or framing to prevent distortion of sides or dislocation of threaded lugs which upon completion must be in perfect alignment and match the corresponding holes in frames or rims so that holding screws can be installed freely without forcing and remain so they can be easily removed when servicing.

3.5 CLEAN-UP

A. At final inspection all fixtures and lighting equipment shall be in first class operating order, in perfect condition as to finish and free from defects, completely lamped, clean and free from dust, plaster or paint spots and complete with the required glassware, reflectors, side panels, louvers or other components necessary to complete the fixtures.

3.6 CEILING TRIM

A. Furnish proper ceiling frames for the ceiling material in which recessed fixtures are to be installed; verify prior to ordering. Rims of all fixtures that overlap ceiling shall be installed tight and snug against the ceiling surfaces so that no light leakage occurs around the rim. If unevenness of surface of fixture allows light to show, then this contractor shall provide soft sponge filler or gasket on all fixtures requiring this treatment.

3.7 FLUSH AND RECESSED FIXTURES

A. Special attention is directed to the special provisions for flush and recessed fixtures in the National Electrical Code. All recessed fixtures shall have top connections to the outlet boxes installed in accordance with the code. Connections to lay-in fixtures shall be made with flexible connections 4'-0" minimum length.

3.8 CEILING FIRE RATING

A. All fixtures to be installed in a fire-resistive ceiling which shall be of a type suitable for such installation to ensure the maintenance of the ceiling fire rating or the fixtures shall be tented per UBC.

END OF SECTION

GENERAL MECHANICAL REQUIREMENTS SECTION 15050

PART 1 - GENERAL

1.01 SCOPE OF WORK

The work covered by this division consists of performing all operations in connection with the installation of heating, ventilating, air conditioning and plumbing. This Contractor shall read and comply with all sections of these specifications, including all General, Special Conditions and Supplementary Conditions.

See Advertisement for Bids, Information for Bidders, Form of Agreement, Bid Bond, Performance and Payment Bond, and Wage Rate Schedule.

Perform all work awarded to the crafts of this Contractor by reason of labor agreements and jurisdictions at no additional cost to the Owner.

Definitions: Wherever the terms "Architect" or "Engineer" are used in these specifications or in the contract, the intent and meaning shall be interpreted by Rivera Engineering.

1.02 DRAWINGS

Drawings and specifications shall be considered as cooperative, and work or materials called for by one and not mentioned in the other, or vice-versa, shall be done and furnished as though treated by both.

In the case of discrepancies, errors or omissions in figures, drawings or specifications, the Architect shall be notified immediately and his decision shall determine the necessary adjustment. Without such decision, said discrepancies shall not be adjusted by the Contractor save only at his expense, and, in case of any settlement or any complication arising from such adjustment to the Contractor, he shall bear all extra expenses involved.

Should it appear that the work intended to be done, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or specifications, the Contractor shall apply to the Architect for such further drawings or explanations as may be necessary, allowing a reasonable time for the Architect to supply same, and the Contractor to conform to same as part of the Contract.

Should any doubt or question arise in respect to the true meaning of the drawings or specifications, reference shall be made to the Architect whose decision shall be final and conclusive. No alleged oral admission, condonation or inadvertent neglect on the part of the Architect will not be accepted as an excuse for inferior work.

All piping and ducts in the finished areas of the building shall be run concealed in chases, furrings, suspended ceilings, etc., unless noted or directed otherwise. Should any condition arise which would cause any piping or duct to be exposed in finished areas, it shall immediately be called to the Architect's attention and the Contractor shall bear any and all expense in connection with rearranging his work as directed to facilitate its concealment. In unfinished spaces such as ceiling spaces and equipment rooms, all piping lines shall be run to a continuous grade and square to the building.

The Contractor shall field verify all existing conditions on-site, verify all dimensions and thoroughly acquaint himself with the details of the building plans and construction before submitting his bid, as no allowance will be made because of the Contractor's unfamiliarity with these details. Place all inserts required for concrete construction in place in the forms before concrete is poured and in masonry walls while they are under construction. All concealed piping and ducts shall be installed prior to the time the chases and furrings are fabricated.

Should the particular equipment which any Bidder proposes to install require other space conditions than those indicated on the drawings, the Bidder shall arrange for such space with the Architect before submitting his bid. Should changes become necessary because of failure to comply with these details, the Contractor shall make such necessary changes at the Contractor's own expense.

The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans which shall be checked by the Architect and approved before the work is started, and interference with the structural conditions shall be corrected by the Contractor before work proceeds.

1.03 CODES AND PERMITS

The mechanical work shall be performed in strict accordance with the applicable provisions of the Uniform Building Code, Latest Edition, the Uniform Plumbing Code, Latest Edition, Uniform Mechanical Code, Latest Edition as adopted and interpreted by the State of New Mexico, City of Santa Fe and the National Fire Protection Association (NFPA) Regulations, current adopted edition, regarding fire protection, heating and ventilating and air conditioning systems, plumbing and electrical systems. All materials and labor necessary to comply with rules, regulations and ordinance shall be provided. In the event of a conflict between the various codes and standards, the more stringent shall govern. The Contractor shall hold and save the Architect/Engineer free and harmless from liability of any nature or kind arising from his failure to comply with codes and ordinances.

Where these specifications and accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Engineer. The Architect shall prepare any supplementary drawings required, illustrating how the work may be installed so as to comply. On approval of the change by the Engineer, the Contractor shall install the work in a satisfactory manner without additional cost to the Owner. On completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved; and, on completion of the work, the Contractor shall obtain and deliver to the Owner, final certificates of acceptance. The Contractor shall furnish copies of each certificate to the Engineer.

Permits necessary for performance of the work shall be secured and paid for by the Contractor.

1.04 OPERATION AND MAINTENANCE

The Contractor shall furnish to the Owner complete operating and maintenance instructions covering all units of mechanical equipment herein specified together with parts lists. Furnish four (4) copies of all literature; each shall be suitably bound in looseleaf book form. A "Lubrication Chart" framed under glass shall be provided listing all types of oil to be used for each piece of equipment and the recommended frequency of lubrication. This chart shall be hung on the wall of the equipment room, descriptions and operating instructions shall also be provided. In addition, the Contractor shall provide a separate maintenance chart/matrix for each piece of mechanical equipment. Contractor shall provide copies to the owner maintenance staff and to the engineer on record.

The Contractor shall also provide not less than three (3) days of operating instructions, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of the equipment. Factory trained experts shall be on hand to conduct instruction periods for all specialized systems such as vrf systems, refrigeration systems, automatic control devices, air handling systems. Submit proposed training sessions schedule to the Architect thirty (30) days before sessions are to begin. Revise if so, directed by the Architect.

1.05 SCHEDULES AND LABELS

All pipe identification legends, instructions and diagrams shall be furnished in quadruplicate and framed and mounted under glass and shall be mounted in all main equipment rooms and at the locations as directed by the Engineer.

The Contractor shall prepare and install in suitable glazed frame, typewritten valve charts giving the number, location and function of each line valve installed under this contract. They shall also install on each valve stem a stamped 1-1/2" diameter brass tag plainly numbered corresponding to the number indicated on the above chart. Tags shall be Seaton Name Plate Company Style P250-BL. Tags shall be secured to valves by heavy figure eight hooks. Valve charts shall be mounted in main equipment rooms and at locations as directed by the Engineer.

1.06 RECORD DRAWINGS

The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all dimensional locations of equipment, ductwork, piping and all deviations and/or changes in the work shall be recorded. VRF refrigeration and condensate piping shall be accurately located by dimensions. The "record" drawings shall be delivered to the Engineer in good condition upon completion and acceptance of the work and before the final payment is made.

1.07 QUALIFICATIONS

All mechanics shall be skilled in their respective trade. All welders shall be certified in accordance with the ASME Boiler Test Code, Section IX, latest edition.

1.08 SHOP DRAWINGS AND SUBMITTALS

Shop drawings or full descriptive catalog data shall be submitted by the Contractor for all items of material and equipment furnished and installed under this contract. The Contractor shall submit to the Engineer a sufficient number of copies of all such shop drawings or catalog data to provide him with as many review copies as he may need; plus three (3) copies for retention by the Engineer. No materials or equipment shall be installed until officially approved by the Engineer.

Before submitting shop drawings to the Engineer for review, the Contractor shall examine them and satisfy himself that they are correctly representative of the material or equipment to which they pertain. The Contractor shall so note these drawings before submitting them. The Contractor's review of the shop drawings which have not been reviewed by the Engineer shall not be used in fabricating or installing any work.

The review of the shop drawings or catalog data by the Engineer shall not relieve the Contractor from responsibility for deviations from the plans and specifications unless he has, in writing, specifically called attention to such deviations at the time of submission and has obtained the permission of the Engineer, he shall state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, the contractor shall pay all costs associated in making the change.

After receiving approval on the make and type of materials, the Contractor shall order such materials in sufficient time so that no delay or changes will be caused. This is done to facilitate progress on the job and failure on the part of the Contractor shall render him liable to stand the expense of any and all delays occasioned by failure on his part to provide necessary details. All shop drawings shall be delivered to the Engineer's office within thirty (30) days from the date of the contract.

Shop drawings will be returned unchecked unless the following information is included: reference to all pertinent data in the specifications or on the drawings, size and characteristics of the equipment, name of the project and a space large enough to accept an approval stamp. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not be a copy of the scheduled data on the drawings.

1.09 GUARANTEE-WARRANTY

The following guarantee is a part of the specifications and shall be binding on the Contractor:

"The Contractor guarantees that this installation is free from mechanical defects. He agrees to replace or repair to the satisfaction of the Architect, any part of the installation which may fail within a period of one year after date established below, provided that such failure is due to defects in the materials or workmanship or to failure to follow the specifications and drawings. Warranty of the Contractor furnished equipment or systems shall begin on the date the system or equipment is placed in operation for beneficial use of the Owner or occupancy by the Owner, whichever occurs first; such date to be determined in writing by the Architect by means of issuing a `Certificate of Substantial Completion,' AIA Form G704."

1.10 OPERATION PRIOR TO ACCEPTANCE

The Owner shall have the right to operate any and all apparatus as soon as and as long as it is in operating condition whether or not such apparatus has been accepted as complete and satisfactory, except that this shall not be construed to mean operation before any required alterations or repairs have been made. This operation does not indicate acceptance of the equipment by the Owner. When the Contractor enters into a contract with the Owner, he agrees to the above.

1.11 SUPPLIER RESPONSIBILITY

Each supplier, whether furnishing equipment as specified or as a substitution, shall be responsible for certifying that the equipment is properly installed and that the warranty is valid. Submit written reports on the installation and equipment performance when requested to do so by the Engineer (or his representative). Each supplier shall be responsible for furnishing qualified personnel at the job site at any time requested by the Engineer (or his representative) during the construction or warranty periods.

PART 2 - PRODUCTS

2.01 PROTECTION OF MATERIALS AND EQUIPMENT

The Contractor shall be responsible for the protection of all work, materials and equipment under this section of work, whether incorporated into the building or not.

The Contractor shall provide protection for all work where necessary, and he will be responsible for all damage done to property during the construction. The above protection shall be maintained while the work is being done and, in no case, shall dirt, grit, etc., be ground into the floor finish or coverings.

The Contractor shall provide space for storage of materials and equipment at ground level. The roof surface shall not be used for storage of materials and any storage of materials within the building shall be approved by the Architect prior to such storage.

2.02 EQUIPMENT MATERIALS

The materials and equipment shall be new and shall be the standard products of the manufacturers regularly engaged in the production of plumbing, heating, cooling and ventilating equipment, and shall be the manufacturer's latest design. Where two or more units of the same class equipment are required, these units shall be the products of the same manufacturer. However, the component parts of the systems need not be the products of the same manufacturer.

All packaged equipment shall be independently Third Party labeled as a system for its intended use by a Nationally Recognized Testing Laboratory (NRTL) in accordance with OSHA Federal Regulations 29CFR1910.399 and NFPA Pamphlet 70, National Electric Code (NEC), Article 90-7.

Specific equipment specified hereinafter is to be considered a standard of quality and operation. Should the Contractor decide to furnish and install equipment and materials other than that specifically mentioned, he shall request prior approval and submit complete information and engineering data on same to the Architect no later than three (3) days before bid date. The Contractor shall obtain written approval before purchasing proposed substitute equipment.

2.03 FLOOR, WALL AND CEILING PLATES

Where exposed pipes pass through floors, finished walls or finished ceilings, they shall be fitted with chromium-plated escutcheons of an approved pattern. Escutcheons and plates in mechanical rooms do not require chrome finish.

2.04 PIPE HANGER PROTECTION AND PIPE SLEEVES

Pipe protection at all hanger points or points of support shall be provided by installing hanger shields manufactured by Pipe Shields Inc.; equal models also acceptable by Uni-Grip.

Install thermal hanger shields throughout all insulated pipe systems, series as designated below:

All refrigerant lines, Pipe Shields, Inc., model CS-CW series.

All other insulated lines (domestic water, roof drains), Pipe Shields, Inc., model CS series.

Provide and install Pipe Shields, Inc., model CSX and CSX-CW series if pipe hangers span greater than ten feet and for all pipe roller applications.

All insulated pipes shall be protected at the point of hanger or trapeze support by a 360 degree insert of high density, 100 psi, water-proofed calcium silicate, encased in a 360 degree sheet metal shield. All inserts shall be same thickness as the adjoining pipe insulation. Shield length and minimum sheet metal gauges shown in chart below. Insulation insert shall extend one inch beyond the sheet metal shield on all refrigerant lines. If pipe hanger spacing exceeds ten feet, and for all pipe roller applications, utilize double layer shield on the bearing surface.

PIPE SIZE	SHIELD LENGTH	MINIMUM GAUGE
1/2 - 1-1/2	4"	26 ga.
2 - 6	6"	20 ga.

All piping required to be routed through fire rated partitions or floors shall be provided with the following manufactured pipe sleeves at each penetration:

All sleeves for bare pipe shall be provided with Pipe Shields, Inc., model WFB series.

All pipe penetrating fire-walls and floors shall be encased in adjoining sheet metal cans, minimum 24 gauge, sized for maximum one inch spacing between pipe and can. Spacing shall be packed on either end with fire-rated Cerafelt packing material.

All sleeves for insulated piping shall be provided with Pipe Shields, Inc., model CS-CW series.

All pipes penetrating fire walls and floors shall be encased in adjustable or fixed length metal cans, minimum 24 gauge, sized for maximum one inch spacing between insulation and can. Insulation shall consist of a 360 degree water-proofed calcium silicate insert sized to extend to a minimum of one inch beyond wall or floor penetration. Calcium silicate insert shall be the same thickness as the adjoining pipe insulation. Spacing between shield and can shall be packed on either end with fire-rated Cerafelt packing material. Insulation insert shall extend one inch beyond sheet metal on all refrigerant lines.

All insulated pipe supports shall be provided and installed by the Contractor at the time the pipe is initially installed.

The Contractor shall be required to apply three inch wide, continuous, vapor barrier tape or band over the butt joints occurring where domestic hot water piping insulation and thermal pipe shields join.

The Contractor shall be required to apply a wet coat of vapor barrier lap cement on all butt joints and seal the joints with three-inch-wide vapor barrier tape or band over the butt joints occurring where domestic cold water or roof drain leader piping insulation and thermal pipe shields join.

2.05 PIPE HANGERS

Unless otherwise specified on the drawings, pipe hangers shall be Fee and Mason or Elcen of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including 4" in size, use Fee and Mason Fig. 199 malleable iron, adjustable, split ring, swivel hanger. For plumbing piping larger than 4", use Fee and Mason Fig. 239 steel clevis hanger. Heating and air conditioning piping larger than 4", but not larger than 12" shall be Fee and Mason Fig. 272. Where several pipes are parallel at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where indicated on the drawings. For copper pipes up to and including 3", use Fee and Mason Fig. 360 malleable iron, copper plated hangers. For copper pipes larger than 3", use Fee and Mason Fig. 364 copper plated clevis hanger.

Hanger rod sizes shall conform to the following schedule:

Pipe up to & including 2" . . . . . 3/8" rods
Pipe 2-1/2", 3" & 3-1/2" . . . . . 1/2" rods
Pipe 4" and 5" . . . . 5/8" rods

Unless shown otherwise on the plans, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction as the case may be, by means of hangers with the following spacing:

Pipe up to & including 1-1/4" . . . . 8'
Pipe 1-1/2" and 2". . . . . 10'
Pipe 2-1/2" and 3" . . . . 10'
Pipe 3-1/2" and 4" . . . . 10'

Unless shown otherwise on the plans, all horizontal runs of copper piping shall be suspended from the floor or roof construction as the case may be, by means of hangers with the following maximum spacing:

Pipe up to 3/4" in size. . . . . 5'
Pipe 1" and 1-1/4" . . . . 6'
Pipe 1-1/2" and larger . . . . 10'

There shall be a hanger within 2" of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Vertical risers shall be supported by approved rise clamps at each floor. Vertical pipes within a space shall have not less than two supports. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment, lights, conduit or any other intermediate supports. Pipe supports shall be suspended from and dedicated only to the major building structural components.

Inserts shall be used where piping or equipment is to be hung from concrete construction. Inserts shall be Grinnell Fig. 281, wedge type, or Elcen No. 61 "Spot Type" concrete inserts. All inserts shall be pretreated to prevent rusting. After forms are removed, clip off all nails flush with the exposed surface of the inserts.

Expansion bolts shall be Ackerman-Johnson, Elcen No. 212 self-drilling type, or Elcen No. 208 wedge stud anchor.

Beam clamps suitable for use with the type of steel construction involved shall be Grinnell or Elcen.

2.06 PRESSURE VESSEL CERTIFICATION

All pressure vessels furnished (including converters, expansion tanks, etc.) shall be fabricated to ASME specifications for the pressure range at which they will be operating. ASME labels and numbers shall be permanently attached to each pressure vessel. Pressure vessels especially built for this project (not standard catalog items) shall also be National Board certified and the proper certification papers shall be submitted to the Architect.

2.07 ISOLATION

Excessive vibration or objectionable noise created in any part of the building by the operation of any equipment furnished and/or installed under the mechanical contract will be extremely objectionable and the Contractor shall take all precautions against the same by isolating the various items of equipment from the building structure and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed by them, and consequently, they shall design all foundations, supports, etc., for their equipment, and all piping with this end in view.

In addition, the Contractor shall supervise the construction of all foundations and supports, whether they build them or not, in order that they may be constructed in such a manner as to prevent the transmission of objectionable noise and/or excessive vibration. Submit calculations on all vibration isolation equipment.

All equipment having moving parts shall be isolated from the building structure by means of Korfund isolation materials, unless specifically noted otherwise. All isolators shall be the same brand and shall be supplied from the same source. Equipment manufacturer's recommendations shall be followed in the isolation of equipment.

Vibration isolators shall have sufficient resilience to meet the following minimum efficiencies:

Motor HP
Up to 5. . . . . 90%
7-1/2 to 15. . . . . 93%
20 to 40 . . . . 95%

Spring isolators shall be of the housed type with ribbed pads bonded to the underside of the base plate, or may be unhoused stable springs. Isolators shall be furnished with snubbers and limit stops where so recommended by the equipment supplier.

The supplier of the isolating equipment shall, upon completion of the job, check all isolating materials and verify that they are installed properly, and submit a report in writing to the Architect.

2.08 ELECTRIC WIRING AND CONTROL EQUIPMENT

Motor starters, control equipment and wiring shown on the electrical drawings, except items otherwise specifically noted, will be furnished and installed by the Contractor. Items of electrical control equipment specifically mentioned to be furnished by the Contractor, whether in these specifications or on the electrical drawings, shall be furnished by the Contractor and shall be mounted and connected as required by the Contractor.

The Contractor shall be required to refer to the electrical control equipment and wiring shown on the electrical drawings to verify the provisions for and installation of all starters and accessories required for interface between the mechanical and electrical systems. Any changes or additions required by specified equipment furnished shall be the complete responsibility of the Contractor furnishing the equipment.

The electrical equipment furnished as part of the temperature controls system shall be final connected to all wiring by the Contractor. The equipment consists of switches, electric switches, relays, timeclocks, flow switches, firestats, freezestats, smoke detectors, sail switches and contacts. The equipment mentioned shall be furnished complete by the temperature controls subcontract or air handling unit manufacturer, and mounted inside of or on the control panels or boards. After mounting is completed, the Contractor shall coordinate and oversee the final wiring of the temperature control equipment by the Contractor.

The Contractor shall clearly verify that all mechanical equipment starters are definitely being provided for and furnished by Contractor prior to submitting his bid. Failure to attain this verification shall require the Contractor to assume the responsibility for all starters in question.

All electrical equipment characteristics (voltages, etc.) must be verified by the Electrical Engineer prior to ordering.

All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion-proof when located in hazardous atmospheres. Type II weather protected motors may be used in lieu of TEFC motors on cooling towers, roof fan units and similar equipment. Motors mounted in direct sun shall be provided with a shield to forbid direct radiation from the sun when the sun is 45 degrees or greater above the horizon. All motors shall have copper windings. All motors to have minimum power factor of 85% or have switched correction to 90%.

Unless indicated otherwise, motors shall be NEMA design B with a service factor of 1.15 with 40-deg.C rise and total temperature rise of 65-deg.C ambient and when powered from the same system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 65-deg.C in the above conditions. Motors located in areas exceeding 40-deg.C ambient shall be factory-rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Type "N" split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.

If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Engineer of the change and then coordinate the change with the Contractor and shall pay all additional charges in connection with the change.

2.09 V-BELT DRIVES

V-belt drives shall be fabric and rubber construction of approved manufacture. Multiple belts shall be matched and all belts shall be adjusted to drive the apparatus properly and to prevent slippage and undue wear in starting. Unless otherwise specified in the mechanical equipment schedule, drives shall be designed for 150% of the specified motor nameplate rating with adjustable motor pulleys. All belts shall be "standard" strength. All V-belt driven equipment shall have a label showing type and size of belt required fastened to belt guard or other conspicuous location.

2.10 BELT AND FAN GUARDS

The Contractor shall provide each V-belt drive assembly with a galvanized iron belt guard, constructed around an angle iron frame, securely bolted to the floor or apparatus. The guard shall completely enclose drives and pulleys and be constructed to comply with all safety requirements. Hinged access doors not less than 6" x 6" shall be provided for access to motors and fan shaft for test purposes. Furnish wire mesh screen cover for double inlet fans, and for all open inlets and outlets for propeller fans, installed so as not to restrict the air flow. All Zerk fittings and oil cups shall be accessible without removing belt guards. All belt guards shall be constructed in accordance with OSHA requirements. Provide coupling guards on all rotating shafts.

2.11 ALTITUDE RATINGS

Unless otherwise noted, all specified equipment capacities are for an altitude of 7000 feet above sea level and adjustments to manufacturer's ratings must be made accordingly.

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILLING

The Contractor shall do all necessary excavation and backfill for the installation of the mechanical systems as may be required. Curb cuts, asphalt and concrete patching, etc., shall be part of the Contractor's responsibility. No extra payment will be made for rock excavation. Trenches for all underground piping shall be excavated to the required depths. The bottoms of trenches shall be tamped hard and graded to secure maximum fill. Bell holes shall be excavated to assure the pipe rests for its entire length on solid ground. Should rock be encountered, it shall be excavated to a depth of 6" below the bottom of the pipe, and before laying the pipe, the space between the bottom of the pipe and the rock surface shall be filled with gravel and thoroughly tamped.

Pipe laid in trenches dug in fill shall be supported down to load bearing undisturbed soil. After the pipes have been tested and inspected, the trenches shall be filled. No roots, rocks, or foreign materials of any description shall be used in backfilling the trenches. The backfill materials shall be identical to the surrounding fill materials and shall be placed in 12" layers, wetted, and compacted to the density of the adjacent soil. This process shall be continued until the trenches are backfilled. All surplus materials shall be hauled from the project by the Contractor at his expense. Compaction tests may be taken at any time when requested by the Architect.

3.02 CUTTING AND REPAIRING

Cutting and repairing shall be the responsibility of the Contractor whose work is involved. Coordinate with others to prevent unnecessary cutting and repairing. Lay out and locate equipment, openings and chases. Install sleeves, inserts and supports. Arrange with those whose work is involved to do cutting and replacing caused by negligence or error with costs reimbursed by the Contractor at fault. Cutting and replacing of existing work shall be the responsibility of the Contractor whose work is being installed. Removal or terminating connections of existing work which is abandoned or replaced shall also be done hereunder to provide correct and finished work.

3.03 FOUNDATIONS

All equipment shall be provided with suitable foundations and supports. It shall be the responsibility of the Contractor to provide for the proper locations of these foundations and supports. This applies to all rooftop equipment, also. All concrete foundations required by equipment furnished by the Contractor shall be constructed by them (except where otherwise noted) in the conformity with the recommendations of the manufacturer of the respective equipment, and with the approval of the Architect.

All corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow 1" below the equipment base for alignment, leveling and grouting with nonshrinking grout. Grouting shall be done after the equipment is level in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary. After removal of the forms, the surface of the foundation shall be rubbed. Unless otherwise noted, foundations shall be a minimum of 6" high. All concrete work performed by the Contractor shall conform entirely to the requirements of the concrete specifications which describe this class of work.

3.04 CONSTRUCTION REQUIREMENTS

Locations of all pipes, duct outlets, appliances, etc., as shown on the drawings, are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. The Contractor will be required to install his work with relation to existing building conditions and shall be entirely responsible for the correctness of his work with reference to finished elevations, etc.

Exterior utilities shown on the drawings are diagrammatic only, and their exact locations, depths, and invert elevations shall be as required for proper flow and coordination with other trades. The drawings show the arrangement of piping and ductwork. Should local conditions necessitate a rearrangement, or if any of the piping or ductwork can be installed to better advantage in a different manner, the Contractor shall, before proceeding with the work, prepare and submit three (3) copies of drawings of the proposed arrangement for the Architect's review.

If the Contractor proposes to install equipment, including piping and ductwork, requiring space conditions other than those shown, or to rearrange the equipment, he shall assume full responsibility for the rearrangement of the space and shall have the Architect review the change before proceeding with the work. The request for such change shall be accompanied by shop drawings of the space in question.

The Contractor is responsible for the proper location and size of all slots, holes, or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves.

The Contractor shall so harmonize his work with that of several other trades that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Sewer lines shall take precedence over water lines in determination of elevations. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit or ductwork.

All oiling devices and all parts of equipment requiring adjustment shall be easily accessible.

The Contractor shall be responsible for providing and installing all counterflashing. All openings in the roof shall be flashed and counterflashed. The Contractor shall notify the General Contractor where each roof penetration is and the size of the openings.

3.05 FLUSHING AND DRAINING

It shall be the responsibility of the Contractor to properly drain and flush all ducts and pipes before use or acceptance, to ensure that all debris is completely removed. Damage caused by such debris remaining in the ducts or pipes shall be repaired by the Contractor, at his expense. The Contractor shall demonstrate to the Architect's representative that all pipe is clean.

3.06 CLEANING

The Contractor shall remove from the building construction site all rubbish and dirt as it accumulates under the contract. At completion, all areas shall be broom cleaned and all obstructions, surplus materials, etc., removed.

3.07 UTILITIES

The location, size and elevation of sewer lines and the locations, size and pressure of water lines are shown in accordance with data given this office by others. As Engineers, we cannot and do not guarantee the accuracy of this data. Each Bidder shall check and verify this data. The points of connection to utility lines are approximate only and shall be verified by each Bidder prior to submitting his bid.

3.08 SITE VISIT

The Contractor shall visit the site prior to bidding and satisfy himself as to the conditions under which the mechanical systems are to be installed. No subsequent allowance shall be made in his behalf for failure to make such a visit.

3.09 ACCESS PANELS

Access panels shall be similar to Milcor, size as required for concealed expansion joints, valves, traps, pitot stations, equipment and similar items requiring accessibility. Notify the General Contractor of each access panel location and the required size. Panels shall be proper type for ceiling or wall in which they are installed. The panels shall be furnished under this section of the specifications, but shall be coordinated to be compatible with walls and ceilings furnished under other sections.

3.10 TESTING

Before completion of this project, the Contractor shall test all materials and equipment which normally require testing. All piping, etc., shall be tested to meet code requirements or the specification requirements, whichever is the more severe. All equipment shall be operated sufficiently long to prove to the Architect that the equipment performs satisfactorily and meets the requirements set forth on the plans or in these specifications.

3.11 CERTIFICATION

Before receiving final payment, the Contractor shall verify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these specifications. Submit certifications and acceptance certificates to the Architect.

3.12 GENERAL PIPING INSTALLATION REQUIREMENTS

Drainage: All piping systems shall be installed so that they may be easily drained. Drain caps, plugs or hose bibbs shall be installed at low points.

Installation of Valves: Valves shall be installed at the locations shown on the drawings and where specified and where directed at site. Gate valves shall be used unless otherwise shown, specified or directed. All valves shall be installed with their stems horizontal or above. Where tight shutoff is required, a composition seat globe valve or resilient seat ball valve shall be used.

All valves which may be used during operation, all control valve assemblies, instrument control cases, liquid level controls, gauge glasses, orifices, relief valves and other equipment which must be observed, adjusted or serviced during operation shall be located conveniently accessible from an operating platform or grade.

In general, relief valves within processing unit limits shall be connected as follows:

-Those in non-hazardous service, such as water, shall discharge directly to collector drains.

-Relief valves should have no piping between the vessel or line and the valve inlet, except as shown on drawings.

-Relief valves shall be installed in a vertical position.

Vent piping shall be braced and supported in a manner that will not produce excessive stresses in the relief valve and will permit removal of the relief valve without necessary temporary supports for the vent lines.

All discharge piping for relief valves shall be arranged to avoid pockets, with weepholes where required.

<u>Equipment Connections</u>: All piping connections to pumps and other equipment shall be installed without strain at the pipe connection of the equipment. The Contractor shall be required as directed to remove the bolts in flanged connections or disconnect piping to demonstrate that the piping has been so connected. Pipe connections to equipment shall be made with unions or flanged fittings. Provide removable headers for large equipment for service access.

<u>Joints</u>: Flanged Joints: All flanged joints shall be face-mounted. Raised face flanges shall not be mated to flat-faced cast iron flanges on valves or equipment. The raised face must be turned off. All flanged bolt holes shall straddle the horizontal and vertical centerline unless otherwise noted.

<u>Screwed Joints</u>: Screwed pipe joints shall have American Standard Taper Pipe Threads ANSI-B2.1-68. Burrs formed when cutting pipe shall be removed by reaming. Care shall be taken that the inside of pipe is thoroughly clean and free of cutting oil and foreign matter before installation. Joints shall be made perfectly tight by the use of Teflon tape, or approved Teflon thread sealing and lubricating compound.

<u>Solder Joints</u>: Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool or wire brush before seating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Joints for seated fittings on water, compressed air below 60 psig and vacuum lines shall be made with a non-corrosive paste flux and solid wire solder. Solder with lead shall not be used. Cored solder will not be permitted. Joints in piping for compressed air above 60 psig shall be made with silver solder. Refrigeration piping shall have silver solder joints also.

Reducers: Reduction in pipe size shall be made with one piece reducing fittings. Bushings reducing at least two pipe sizes will be acceptable only when there is no room for reducing couplings or swagged nipples.

Unions: All piping unions shall be of the ground joint type constructed from materials equivalent in alloy composition and strength to other fittings specified with which they are used. Union pressure classes and end connections shall be the same as the fittings used in the lines with the unions. Steel unions shall have hardened stainless steel seating surfaces on both faces.

3.13 TESTING FOR PIPING SYSTEMS

General: Before insulation is applied, all piping, equipment and accessories installed under this contract shall be inspected and tested by the Contractor. All labor, material and equipment required for testing shall be furnished by the Contractor. The Contractor shall be responsible for all repairs and retesting as required.

All instruments and other equipment whose safe pressure range is below that of the test pressure shall be removed from the line or blanked off before applying the tests. Prior to performing tests, all lines shall be "blown" free of all loose dirt and foreign particles. The lines shall then be thoroughly flushed with water (liquid lines only) or compressed air (for gas lines) at a sufficient flow rate and period of time, to insure complete cleaning of the lines of all dirt, scale and foreign matter. Cleaning and flushing of the lines shall be subject to approval. After testing and flushing lines, all filters and strainers shall be cleaned.

Safety: Since the risk of failure with the attendant possibility of injury is appreciably greater during testing, all safety measures required by codes or ordinances shall be taken, or codes that are reasonably applicable to the situation shall be applied.

Concealment: Equipment or piping to be pressure tested shall not be insulated, covered or concealed prior to that test. Compression joint underground piping may be backfilled prior to pressure test except that joints shall remain exposed until after the test, but tie rods, clamps, etc., shall be in place and fastened.

Pressure Ratings: These tests shall not be used to establish pressure ratings.

System Protection: Protect all piping and equipment against over-pressure, collapse from vacuum and hydraulic shock during the filling, testing and draining procedures. Seats of iron valves shall not be subjected to a pressure in excess of the maximum cold working pressure of the valve. Pressure tests against other closed valves shall not exceed twice the normal rating. Note that where significant differences in elevation exist, there is a risk of over-pressure in the lower portions of the system in order to attain test pressure in the upper portion of the system.

Test Temperature: Apply test pressure only after the system and test medium are at approximately the same temperature, preferably not less than 60-deg.F. Note that some applicable codes require testing above a specified minimum temperature.

Removals: Remove from the system all pumps, traps, expansion joints, instruments, control valves, safety valves, rupture discs, orifice plates, etc., which might be damaged by the test, or are designated by the Architect/Engineer. Also remove all items such as orifice plates which might trap air in a system to be hydrostatically tested. Disconnect all instruments and air lines where copper tubing starts.

Sectionalizing: Systems may be separated into sub-systems for testing if such action will expedite or simplify the testing.

Temporary Supports: During hydrostatic testing of lines, provide temporary supports to prevent over-stressing supports or hangers. When tests are completed, remove all temporary supports, locks, stops, etc., and adjust for their cold load alignment.

Testing: Piping shall be tested hydrostatically at the test pressure specified and shall show no drop in pressure in a 4 hour period. See various plumbing sections for testing piping systems.

Test Report: A detailed report of pressure tests on piping and equipment shall be forwarded in duplicate to the Architect/Engineer. This report shall show date of test, lines tested, test medium, length of time test pressure was held, pressure drop or rise and extent of venting or re-pressurizing.

Alignment: All installed pipe lines shall be straight and shall remain straight against strains. Proper allowance shall be made for expansion and contraction.

Clean as Installed: All piping shall be kept free from scale or loose dirt when installed, and must be kept clean during the completion of the installation. All openings in the piping systems shall be capped or plugged while awaiting further connections.

Insulated Fittings: Install between any dissimilar metal such as steel and copper.

Expansion and Contraction: The Contractor shall make all necessary provisions for expansion and contraction with proper fittings, anchors, dresser couplings, loops, etc. Install flexible connectors on each pipe at each building expansion joint. Provide pipe guides on each side of expansion fittings or loops and anchor in accordance with the expansion fitting manufacturer's recommendations.

Welding: All welding of piping covered by this specification, regardless of condition of service shall be accompanied as follows:

-The welding shall be in accordance with the recommendations of the American Welding Society. Mitering of pipe to form elbows, notching to form tees, or any similar construction will not be permitted. Welding fittings shall be installed on all welded lines. Joints to be welded shall be properly aligned and spaced, using special welding clamps where necessary. All welders to be employed shall have passed qualification tests prescribed by the National Certified Pipe Welding Bureau (or by another reputable testing laboratory or agency) using procedures approved by the American Society of Mechanical Engineers or the American Welding Society. The welders will be required to pass qualification tests when the work of the welder creates a reasonable doubt as to his proficiency. Tests shall be conducted at no additional expense to the Owner.

-Each welder shall, in addition to having passed the prescribed qualification test (as noted above), prepare a sample weld at the job site on a portion of pipe that is cut such that the cross section of the weld is open to view. The sample weld should be prepared using a 6 inch diameter pipe. The sample shall reflect a continuous weld with perpendicular cut out to show the weld in cross sectional view. This sample, when accepted and approved by a certified welding inspector, shall be used as a standard of quality to compare to other welds that this welder will be performing on the job. This same sample weld will also be a basis for accepting or rejecting the welder for working on this project. The sample weld shall be identified with a date and the welder's name and shall be kept at the site throughout the project.

-All welding on pressure piping shall conform to all of the requirements of the American Society of Mechanical Engineers Code for Pressure Piping - B31.1 (An American National Standards Institute publication), as defined in the latest edition of the ANSI Power Piping B31.1 Manual. All welding shall also conform to all of the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. All chapters, current addenda and supplements of these manuals shall apply. This code shall be used to establish standards of performance and quality of welds. However, the Owner reserves the right to perform radiographic testing of any and all welds, to compare any of the welds to the approved "standard" sample welds of each welder, and to compare the welds to the welding diagrams and sketches of those recommended in the ANSI B31.1 Power Piping Manual. The intent is to obtain the highest quality welding job possible.

The cost for any initial radiographic testing, for random inspection, shall be paid for by the Owner. If radiographic random testing reveals that a weld is defective, the Contractor shall bear the cost of all repairs and re-testing necessary to be made to subject weld until conformance with radiographic tests is reached. The potential for random radiographic testing and welding quality control applies to all pressure piping systems in this project, including systems below 100 psig. If a question should arise regarding the possibility of faulty welding or if there are obvious visual defects in the welding, the Contractor shall be required to correct such deficiencies to a quality level consistent with the recommendations, welding diagrams and sketches in the ANSI B31.1 Manual. The quality level shall also reflect that of the approved sample welds accomplished by each welder for this particular project.

Bending: No bending of pipe will be permitted.

General: The installation shall be coordinated with respect to space available with heating, cooling, ventilating and electrical installation. In every instance where there is a conflict in the routing of the piping and the ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows; shall not encroach on aisles, passageways and equipment; and shall not interfere with the servicing or maintenance of equipment.

Pipes shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Cutting or weakening of structural members to facilitate piping installation is not permitted. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers.

Piping above ground shall be run parallel with the lines of the building unless otherwise noted on the drawings. Unless otherwise shown on the drawings, horizontal piping shall pitch down in the direction of the flow with grade of not less than 1 inch in 40 feet. Piping connections to equipment shall be in accordance with details shown on the drawings. Service pipe valves and fittings shall be kept a sufficient distance from other work, and not less than 1/2 inch between finished covering on the different services.

3.14 COOPERATION WITH OTHER TRADES

The Contractor shall refer to other sections of these specifications covering the work of other trades which must be carried out in conjunction with the mechanical work so that the construction operations can proceed without harm to the Owner from interference, delay or absence of coordination.

3.15 FIELD MEASUREMENT

The Contractor shall verify the dimensions and conditions governing his work at the building. No extra compensation shall be claimed or allowed on account of differences between actual dimensions and those indicated on the drawings. He shall examine adjoining work, on which his work is dependent for perfect efficiency, and shall report any work which must be corrected. No waiver of responsibility for defective work shall be claimed or allowed, due to failure to report unfavorable conditions affecting his work.

Ceiling cavity space must be carefully coordinated with all trades; however, installation of mechanical equipment within the ceiling cavity space, in the event of conflict, shall be in the following order: plumbing waste lines; supply, return and exhaust ductwork; fire sprinkler and roof drain mains, domestic hot and cold water; and fire sprinkler branch piping and sprinkler runouts.

3.16 PROTECTION OF MATERIAL AND EQUIPMENT

All work, equipment and materials shall be protected at all times to prevent obstruction, damage or breakage. All pipe openings shall be closed with caps or plugs during installation. All equipment shall be covered and protected against dirt, water, chemical or mechanical injury. At the completion of the work, all equipment shall be thoroughly cleaned and the entire system shall be delivered in a perfect, unblemished condition.

3.17 PAINTING AND IDENTIFICATION

All equipment shall be delivered to the job with suitable factory finish. Should the finish be marred in transit or during installation, it shall be finished to present a neat, workmanlike appearance.

Except as elsewhere hereinafter specifically required, any painting of equipment, piping, ductwork, grilles, insulation, etc., furnished and installed under this section of the specifications will be done by the Contractor. However, the Contractor shall leave his equipment clean and free from any grease, dirt, rust, etc., in suitable condition for painting.

No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during the painting operation.

The piping shall be painted the basic color as listed and shall be marked every 20' on centers with Brady pipe markers. Arrows, approximately 6" in length and spaced about 10' on centers shall indicate the direction of the flow pipe. Locate additional labels as required in mechanical rooms. Staple in place, brush with clear lacquer. Markers shall state pipe size, flow direction and pipe usage (such as "refrigeration" etc.).

3.18 LUBRICATION

The Contractor shall provide all oil for the operating of all equipment until acceptance. The Contractor shall be held responsible for all damage to bearings while the equipment is being operated by him up to the date of acceptance of the equipment. The Contractor shall protect all bearings and shafts during installation and shall thoroughly grease the steel shafts to prevent corrosion. Extensions shall be provided at all grease fittings requiring limited access.

3.19 OWNER FURNISHED EQUIPMENT

Certain items of mechanical equipment as listed on the drawings and/or specifications will be furnished to the Contractor by the Owner. The Contractor shall install and connect such Owner furnished material and equipment. All such equipment is identified in the specifications and/or the drawings.

3.20 CLEANING OF DUCTS

Before the ceilings are installed and before ductwork located in tunnels or chases is covered, it will be required that the fans be operated at full capacity to blow out dirt and debris from ducts. If it is not practical to use the main supply blower for this test, the ducts may be blown out in sections by a portable fan.

3.21 PROTECTION AGAINST HAZARDOUS CONDITIONS

The Contractor shall take precautions against hazardous construction conditions at all times during construction. The final condition of the facilities shall be safe, and where safety to operating personnel is jeopardized, suitable signage shall be posted.

Protruding metal (bolts, steel angles, etc.) potentially hazardous to maintenance and operating personnel, shall be cut back and/or protected to reduce the risk of injury. All openings between floors shall be protected with barriers around the openings, gratings across the openings, or steel bars through the openings to avoid and protect against injury.

3.22 HAZARDOUS SIGNS

Equipment rooms, fan plenums, and the like containing moving or rotating parts, floor openings, or other potentially hazardous environments shall include signs on all doors entering such spaces that shall read similar to the following: "Hazardous Area - Authorized Personnel Only."

The Contractor shall survey the final premises to determine if any such potentially hazardous areas exist. If the Contractor feels that hazards exist, that cannot be suitably protected through the above typical methods, he shall forward in writing to the Architect his concerns, and request for a decision concerning the referenced hazard, prior to the final inspection of the facilities.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS

Conform with applicable provisions of the General Conditions, Supplementary Conditions and General Requirements.

1.02 RELATED SECTIONS

Section 15050, General Mechanical Requirements.

1.03 SCOPE

All thermal insulation and acoustical lining for the mechanical systems shall be installed by a contractor normally engaged in insulation application. No pipe insulation shall be applied until piping has been tested and approved. No duct insulation shall be applied until the ductwork has been approved. All surfaces to be insulated shall be dry and free of loose scale, dirt or oil before the insulation is applied. All insulation shall be applied strictly in accordance with the manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 INSULATION

Insulation shall be as manufactured by Owens Corning Fiberglass, Gustin-Bacon, Knauf, Manville or Armstrong, or approved equal, and shall be as equal to that specified below. Insulation and all materials on the exterior surfaces of ducts, pipes and equipment, except where located as described below, shall have a composite fire and smoke hazard rating not exceeding: Flame spread - 25; fuel contribution - 50; smoke developed - 50, as determined in accordance with ASTM Standard E-84. Linings in ducts, plenums and equipment shall meet the Erosion Test Method described in Underwriters' Laboratory Publication No. 181.

These linings and all insulation on piping and ductwork located in building spaces used as air plenums shall have fire and smoke hazard rating not exceeding: Flame spread - 25; fuel contribution - 50; smoke development - 50, as determined in accordance with ASTM fittings shall have the same ratings as the insulation. Information must be submitted to Architect by means of manufacturer's literature showing that the materials conform to above specifications.

2.02 FITTINGS

All fittings except as otherwise specified, shall be insulated with the same material and thickness as specified for the pipe.

Valves and fittings, where required to be insulated, shall be covered with fitting mastic reinforced with fiberglass fitting tape and finished to a smooth surface or prefabricated or molded insulation may be used on all fittings where applicable.

2.03 METAL JACKETING

Metal jacket shall be 0.016-inch smooth aluminum backed with a 60 pound kraft paper vapor barrier and connected with a modified S-lock equal to Premetco "Loc-Jack" Z- crimp, factory or field installed. All insulated piping subject to physical injury, such as piping on hangers, on pipe supports, routed through pipe sleeves, of an elevation 8 feet or less above the floor and/or piping in the Mechanical Room shall be protected with a metal jacket.

2.04 PVC JACKETING

PVC jacketing and one piece pre-molded PVC insulation fittings shall be as manufactured by Zeston, Inc. or approved equal. Insulation of jacket and insulation fittings shall be in accordance with manufacturer's recommendations. All insulated piping and fittings in Mechanical Equipment Rooms below 8' elevation, shall be covered with PVC jacket, or metal jacket as described in paragraph 2.03.

PART 3 - EXECUTION

3.01 DOMESTIC HOT WATER AND DOMESTIC HOT WATER RECIRCULATION

All pipe, valves and fittings (except unions, flanges and strainers) shall be insulated with 1 inch thick Fiberglass one-piece preformed pipe insulation with all purpose (ASJ) fire retardant jacket. Fittings shall be finished with fitting mastic reinforced with Fiberglass fitting tape and finished to a smooth surface. Piping larger than 1-1/2 inch shall be insulated with 1-1/2 inch thick insulation. All insulation shall have a "K" factor of 0.24 at 100-deg.F.

3.02 DOMESTIC COLD WATER PIPING / CONDENSATE PIPING

Insulate all cold water and condensate piping. Unless otherwise shown on the drawings, use 1 inch thickness for pipe sizes up to and including 3 inch diameter, and 1-1/2 inch thickness for pipe sizes over 3 inches in diameter. Provide factory or job-applied jackets. Use Flame Retardant (FR) jacket having 0.01 perm rating, installed with foil side next to insulation. Insulation shall have a "K" value of 0.24 at 100-deg.F.

3.03 REFRIGERANT SUCTION PIPING

Suction piping shall be insulated using 3/4 inch thick Owens Corning O-C Flexible Tubing. All butt ends and longitudinal joints shall be sealed with O-C 500 adhesive as manufactured by Owens Corning Company. When exposed to the weather, flexible tubing insulation shall be protected by applying two (2) coats of exterior weatherproof coating as recommended by the manufacturer.

3.04 ALUMINUM JACKET

Metal jacketing shall be 0.16" smooth, aluminum-backed with a 60 pound Kraft paper vapor barrier and connected with a modified "S" lock equal to Premetco "Loc-Jack" Z-crimp. Longitudinal and circumferential joints shall be sealed with asphalt mastic or other approved vapor- resistant cement before applying metal jacketing.

All circumferential joints shall be sealed with a final joint closure. Circumferential joints shall be sealed with a 1-3/4 inch .016 aluminum preformed strap backed with mastic centered on the joint and held in place by a 3/4 inch wide aluminum strap buckled in place over the sealant strap. Direct buckling of the sealant with a factory fabricated modified "S" slip securely drawn into place. Exposed fittings and valves shall have insulation covered with metal jacket as specified herein.

3.05 SUPPLY AND RETURN DUCTS

All supply and return air ducts shall be insulated except pre-insulated flexible ducts and ducts with acoustical lining. See Section 15800 for pre-insulated flexible ducts.

<u>Heating Ducts - Supply and Return</u>: Ducts handling heated air only shall be insulated with 1-1/2 inch thick, 3/4 pound density Fiberglass Type 75P, Manville Microlite, or Gustin-Bacon Ultrafine No. 1001 duct insulation. Install duct insulation with cord looped not more than 8" on centers. Insulate outside air ducts.

<u>Cooling Ducts - Supply and Return</u>: Ducts handling cold air shall be insulated with 1-1/2 inch thick, 3/4 pound density Manville Microlite, with foil vapor barrier. The insulation shall be held in place with spot daubing of a quick tacking rubber base adhesive on approximately 6 inch centers. All end and longitudinal joints shall be butted firmly and the vapor barrier shall be overlapped not less than 2" and sealed continuously with Benjamin Foster 85-20. If staples are used, seal over staples with Childer CP-32, or an approved equal.

<u>Exposed Ducts</u>: Exposed supply ducts located in equipment rooms and in finished rooms, except sheetmetal ducts insulated internally with acoustical lining, shall be insulated as specified above for cooling ducts and covered with glass cloth covering. Apply Sealfas 60 to 70 square feet per gallon, embed duramesh glass cloth, smooth all wrinkles and apply finish coat of Sealfas.

3.06 INSULATION AT VALVES

The termination of all insulation on pipes at valve connections or union, etc., shall be beveled and finished the same as called for on all fittings.

3.07 ACOUSTICAL LINING

The acoustical lining shall be Manville Micro Coustic or approved equal. All acoustic lining shall have a fire and smoke hazard rating not exceeding:

Flame spread - 25; and

Smoke developed - 50.

The lining shall be applied using Benjamin Foster 85-20 adhesive, and also secured on not more than 18 inch centers with Stic-Clips (on concrete) or welded pins (on metal), and held with washers not less than 1-1/4 inch diameter. The acoustic lining shall be installed to completely line the ducts. For plenums of air supply systems, a 2 inch thick (unless otherwise specified on the drawings), 1-1/2 pound density lining is required, and all other lining shall be 1 inch thick, 1-1/2 pound density.

END OF SECTION

WATER SUPPLY SYSTEM (INTERIOR) SECTION 15401

PART 1 - GENERAL

1.01 REQUIREMENTS

Conform with the applicable provisions of the General Conditions, Special Conditions, and the General Requirements.

1.02 RELATED SECTIONS

Section 15050, General Mechanical Requirements.
Section 15450, Plumbing Fixtures.
Section 15405, Sanitary Drainage System (Interior).
Section 15250, Mechanical Systems Insulation.

1.03 SCOPE

A complete domestic cold water, hot water and recirculating hot water system including water heaters, pumps, shock absorbers, and associated miscellaneous items as shown on the plans. This section is limited to the items referenced herewith within the building envelope and out to a point 5'-0" outside of the building, unless noted otherwise on the drawings.

Furnish and install all concrete, grout, and other required materials, to fill all blockouts and/or sleeves left open for the Contractor's convenience, or for the installation of this work.

The work included in this contract consists of furnishing all labor, materials, equipment, tools and services; and includes all costs of permits and all costs whatsoever which may be required to completely install and place in operation the systems herein described.

Equipment and Fixture Connections: The Contractor shall be responsible for rough-in and connection to equipment furnished by the Owner, by others, or as under the EQUIPMENT Sections of this specification. This shall include any equipment requiring connection, to domestic hot or cold water systems, direct or indirect waste, or vent piping whether shown on the Plumbing or Mechanical Drawings or not. The Contractor shall coordinate his rough-in work with the supplier of the equipment actually being furnished, and shall conform to the service requirements of the furnished equipment. All final connections required by such equipment shall be made and tested by the Contractor. Carefully review the Architectural drawings for equipment and fixture locations.

PART 2 - PRODUCTS

2.01 PIPING

Domestic water system piping below grade or slab on grade shall be Type "K" soft temper copper tubing. Type "L" soft temper tubing may be used only if specifically approved by the Engineer and shall not be at the Contractor's option.

Domestic water system piping above slab on grade shall be Type "L" hard drawn copper tubing.

2.02 FITTINGS

Fittings for copper piping below grade with brazed joints shall be wrought copper (the same thickness as the piping) for solder joint-pressure type.

Fittings for copper piping above grade shall be wrought copper or cast red brass for solder joint-pressure type.

2.03 JOINTS

Joints for copper piping systems 1-1/2" and smaller shall be made using 95-5 Tin-Antimony solder. (No 50/50 solder will be permitted on domestic water piping, hot nor cold.)

Joints for copper piping systems 2" and larger above grade slab and all sizes below grade slab shall be made using Sil-Fos, Easy Flow, or Phos Copper brazing rods with a melting temperature above 800-deg.F.

2.04 PROTECTION OF PIPING

Copper piping installed below grade or slab on grade shall be protected against corrosion as follows.

One and one half inch (1-1/2") or smaller shall be installed in polyethylene protective conduit terminated not less than 6" above finished floor slab and a minimum 36" from the building outside wall.

Two inch (2") or larger shall be protected by a double wrapping of X-Tru-Coat, or Scotch Wrap, or by a double coat of bituminous paint. Termination of coating shall be the same as described for 1-1/2" or small pipes.

2.05 SHOCK ABSORBERS

Furnish and install factory-sealed shock absorbers conforming to Federal Specification WW-P-541 at locations shown on the drawings and/or as outlined by Plumbing Drainage Institute Standard WH-201.

2.06 WATER HEATING EQUIPMENT, PUMPS AND OTHER EQUIPMENT

Domestic water heating equipment, pumps, and other equipment, are specified in the Plumbing Equipment Schedule on the plumbing drawings.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPING

All water piping shall be run free from traps and arranged so that all parts of the system can be drained. Provide accessible 3/4" gate valves with hose ends where required for this purpose. Provide expansion loops or connections throughout the system to allow for adequate horizontal and vertical expansion and contraction, and for building setting at the point of water main entry into the building.

All pipe size changes shall be made with reducing fittings or bell reducers or increasers where any change in the pipe sizes occur. No bushing of any nature shall be allowed in piping.

Provide dielectric couplings wherever piping and fittings of ferrous and nonferrous metals are joined.

3.02 VALVE CONTROL

Control valves shall be installed where shown on the plans and/or as directed, wherever necessary for controlling the several sections of the domestic water system. Valves shall be provided on all inlet connections to all kinds of apparatus, all risers and all groups of fixtures. Groups of fixtures shall be arranged to have their group valves in one location. Access shall be provided to all concealed valves by means of access doors furnished by the Contractor and installed by the Contractor. The Contractor shall coordinate the location of valves with architectural features of the building in order that the access doors will be located symmetrically with the other features.

The hot and cold water supply lines to each and every fixture specified on the drawings shall be equipped with approved stop valves, which shall be chromium-plated where exposed chrome-plated pipe is used. (See Plumbing Fixture and Equipment Specifications Section 15450.)

3.03 VALVES

All valves shall be designed for repacking under pressure when fully opened and shall be equipped with packing suitable for the intended service. Gate valves shall be installed in the horizontal position, other valves in the vertical position and, whenever possible, shall be grouped. Valves shall be manufactured by Jenkins, Nibco, Crane, Milwaukee, Walworth, Norris, Stockham, Kennedy, Lunkenheimer, Nordstrom, Dezurick or Grinnell and shall be of the following types (all valves of the same type shall be of the same manufacturer).

<u>Ball Valves</u>:

Screwed	2-1/2" and smaller	Milwaukee BA-100
Solder	2" and smaller	Milwaukee BA-150

<u>Gate Valves</u>:

Screwed	2-1/2" and smaller	Milwaukee 1141 or 1151
Solder	2-1/2" and smaller	Milwaukee 1169
Flanged	3" and larger	Milwaukee F-2882 or F-2885

<u>Check Valves</u>:

Screwed	2-1/2" and smaller	Milwaukee 510
Solder	2-1/2" and smaller	Milwaukee 1510
Flanged	3" and larger	Milwaukee F-2974

<u>Balancing Cocks</u>:

Screwed	Nordstrom	Fig. 142 w/indicator and indicator arc
Flanged	Nordstrom	Fig. 143 w/indicator and indicator arc

<u>Underground Gate Valves</u>:

Water	Kennedy	Fig. 571A with Fig. 123 Service box and Fig. 122 key

Pressure Reducing Valves: As specified in Plumbing Equipment Schedule on drawings.

3.04 RELIEF VALVES

All pressure vessels shall be equipped with ASME rated and labeled valves as manufactured by Keckley, or Bell and Gossett. Size for proper flow and pressure as directed by equipment manufacturing data or by the Engineer. Extend discharge lines to nearest floor sink, or to outside, or as directed at the job site by the Engineer.

3.05 UNIONS AND FLANGES

Unions and flanges shall be installed at all points necessary to permit easy removal of valves and equipment without injury to other parts of the system. Unions in screwed piping shall be Grinnell Fig. 459. Unions in copper piping shall be Grinnell Fig. 9102 in wrought copper, Fig. 9730 in cast brass. Fabricate flanged headers to make it possible to remove tube bundles, or similar items, without having to disconnect any major portions of piping or to use cutting torches.

All connections between ferrous and non-ferrous piping or equipment shall be made with dielectric unions. Dielectric material shall not be paper.

3.06 HYDRANTS AND HOSE BIBBS

Wall and box hydrants shall be the type as specified in the Plumbing Equipment Schedule on the drawings. Deliver all hydrant keys and handles to the Owner's representative.

Hose bibbs shall be the type as specified in the Plumbing Equipment Schedule on the drawings with a vacuum breaker on the threaded outlet.

3.07 AIR CUSHIONS

Install 12 inch minimum, full size, vertical cushion pipe at each hot or cold water faucet or outlet.

3.08 ACCESS DOORS

All concealed valves, controls, etc., shall be provided with access doors. Type of doors as specified in the Plumbing Equipment Schedule on drawings.

3.09 STRAINERS

Strainers shall be of the "Y" pattern type unless shown or specified otherwise. Ends shall be screwed or flanged to match the type of joints in the piping in which the strainers are installed. Each strainer shall have the proper type of opening size for the flow duty, brass, or moneal screen. Where space does not permit the installation of the "Y" strainer, install an equivalent basket strainer. Strainers for screwed piping shall be SARCO Type AT for steel piping, SARCO Type D; or equivalent as manufactured by Grinnell, Crane, Keckley, Leslie or McAlear. Install a blowoff valve and discharge piping to floor sink at each strainer.

3.10 BACKFLOW PROTECTION

Protection: All plumbing fixtures, faucets with hose connections, and all other equipment having plumbing connections shall have their water supplies protected against back-siphonage, as shown on the drawings, or as required by local health authorities.

Testing: Arrange for testing backflow devices as required by the local health authorities and the Engineer.

3.11 TESTS

All water piping, hot and cold, shall be made tight under a hydrostatic test pressure of 150 pounds per square inch and maintained without pressure loss and visible leakage for a minimum of four (4) hours. No caulking to joints will be permitted. Any joint found to leak under this test shall be broken, remade, and a new test applied. Certify to the Architect that the tests have been completed.

3.12 STERILIZATION

On the building side of the water supply piping, provide a 3/4 inch connection through which chlorine shall be introduced into the building water piping systems to sterilize those systems thoroughly.

After completion of testing, the entire cold and hot water piping systems, with attached equipment, shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine conform to U.S. Army Specification No. 4-1, or calcium hypochlorite or chlorinated lime conforming to the requirements of Federal Specification 0-C-114, and shall be pumped into the system through the connection described above. The sterilization solution shall be allowed to remain in the system for a period of twenty-four (24) hours during which time, all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 parts per million.

The sterilization process shall be conducted as described by the State of New Mexico, Department of Public Health, and upon completion of the process, the Contractor shall test and certify the cleanliness of the water piping system. The Contractor shall pay all costs and charges incidental to this test.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS

Conform with applicable provisions of the General Conditions, Special Conditions, and General Requirements.

1.02 RELATED SECTIONS

Section 15050, General Mechanical Requirements.
Section 15250, Mechanical Systems Insulation
Section 15450, Plumbing Fixtures.
Section 15401, Water Supply System (Interior).

1.03 SCOPE

The building sanitary drainage system limited to a point 5'-0" outside of the building (unless noted otherwise) shall be installed, as shown on the Plans, complete with all fixtures, drains, traps and required connections. All fixtures and drains shall be properly trapped and vented as required by the applicable plumbing code.

Furnish and install all concrete, grout, and other required materials to fill all blockouts and/or sleeves left open for the Contractor's convenience, or for the installation of this work.

The work included in this contract consists of furnishing all labor, materials, equipment, tools and services, and includes all costs of permits and all costs whatsoever which may be required to completely install and place in operation the systems herein described.

Equipment and Fixture Connections: The Contractor shall be responsible for rough-in and connection to equipment furnished by the Owner, by others, or as under Equipment Sections of this specification. This shall include any equipment requiring connection to domestic hot or cold water systems, direct or indirect waste, or vent piping whether shown on the Plumbing or Mechanical drawings or not. The Contractor shall coordinate his rough-in work with the Supplier of the equipment actually being furnished and shall conform to the service requirements of the furnished equipment. All final connections required by such equipment shall be made and tested by the Contractor. Carefully review the Architectural drawings for equipment and fixture locations.

PART 2 - PRODUCTS

2.01 PIPING

Soil, waste, and vent piping below slab on grade shall be service weight bell and plain end. (At the Contractor's option, or if specifically noted on the drawings, copper DWV pipe with double bituminous coating may be used.)

Soil, waste, and vent piping above slab on grade shall be service weight bell and plain end. No-hub piping may be used only when expressly approved by the Engineer. (At the Contractor's option, or if specifically noted on the drawings, Schedule 40 galvanized steel or copper DWV pipe may be used.)

Trap arms shall be galvanized Schedule 40 pipe encased in chrome-plated thin wall brass tubing, or DWV copper pipe also encased in chrome-plated thin wall brass tubing or chrome-plated Schedule 40 brass pipe if specified under Fixtures Specification.

2.02 FITTINGS

Fittings for sanitary cast iron waste system shall be service weight cast iron with drainage pattern with bell and plain end or no-hub type.

Fittings for sanitary DWV copper system shall be copper or brass with drainage pattern, solder type.

Fittings for Schedule 40 galvanized waste system shall be galvanized cast iron with drainage pattern.

Fittings for sanitary galvanized vent system shall be galvanized malleable iron fittings.

Fittings for sanitary cast iron vent system shall be cast iron.

Fittings for DWV copper vent system shall be copper or brass, solder type.

Tapped sanitary tees and crosses will be permitted only for fixtures connections. Crosses shall have the barrel of the fitting two pipe sizes larger than the largest branch inlet.

Vent fittings installed below slab on grade shall have drainage pattern.

2.03 JOINTS

Joints on cast iron soil waste and vent system below grade slab shall be made with oakum and pure lead, or with Tyseal type neoprene push gaskets. Installation technique and pipes bedding shall comply with the applicable plumbing code requirements to achieve rigid installation.

Joints on copper DWV soil waste and vent system below and above grade slab shall be soldered with 50/50 solder.

Joints on cast iron soil waste and vent system above grade slab shall be as permitted for below grade slab installation or with heavy duty no-hub all stainless steel clamps as manufactured by Clamp-All or Anaco Corporation, or with cast iron no-hub clamps MG type with stainless steel bolts and nuts. Standard duty stainless steel no-hub clamps may be used when expressly approved by the Engineer. Pipe support above grade slab shall comply with the applicable plumbing code requirements to achieve rigid installation.

2.04 EQUIPMENT DRAINS

Equipment drain lines shall be either Schedule 40 galvanized steel pipe with galvanized malleable iron fittings or Type "M" copper tubing with solder fittings. (Equipment drain lines from pure and ultra pure applications shall be Schedule 40 pressure polypropylene with mechanical type joints.)

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPING

The Contractor shall promptly install sewer, drains, and piping after excavating, chasing or cutting for same as has been done, so as to keep the openings for such piping open as short a time as possible. No piping shall, however, be permanently closed up, furred in or covered before the testing and examination of same by the authorities having jurisdiction.

All piping shall be run in the most direct manner. Horizontal pipe shall have a grade of one-quarter (1/4) inch per foot wherever possible and not less, in any case, than one-eighth (1/8) inch per foot (1/8" per foot allowable only for pipes 4" in diameter and larger). All offsets shall be 45-deg. or less.

Cleanouts shall be provided at:

- The bottom of each soil or waste stock;

- On horizontal drain lines below grade longer than 5';

-On each kitchen sink and urinal;

-On horizontal vent lines if rising at an angle less than forty-five (45) degrees from the horizontal up to a point at least six inches (6") above the floor rim of the fixture served by the vent;

-At each change of direction greater than ninety (90) degrees;

-In interior horizontal runs below grade at intervals not exceeding 75';

-In exterior horizontal runs at intervals not exceeding 100';

and/or

-As shown on the drawings and as required by the plumbing code in addition to these specifications.

Two-way cleanouts outside of the building shall be installed as shown on the drawings, or as a substitution for an upper terminal cleanout.

All interior cleanouts shall be the same size as the pipe served up to 4" size and 4" for all larger lines. Exterior cleanouts shall consist of a concrete encased wye in the line with sewer pipe extending upward therefrom and terminating in a concrete slab at grade. A cleanout casting as specified shall be set on this slab in such a manner as to be flush with the finished grade. All exterior cleanouts shall be the same size as the sewer up to 6" size and shall be 6" for all larger lines. See Cleanout Details and Specifications.

Fixture vent piping shall be kept above the fixtures in such a manner as to preclude the use of the vents as waste, if the waste pipes later become obstructed. All vent pipes shall be properly graded without drops or sags, and so connected as to drip back to waste pipes by gravity. Whenever practical, or as shown on the drawings, two or more vents shall be connected together at a point not less than 6" above flood rim of fixtures served by the vent, and extended as one vent through the roof. Vent piping installed below grade slab shall be not less than 2" diameter.

3.02 FLASHINGS

Flash vent piping through roof (V.T.R.) with lead flashing, weight of not less than four (4) pounds per square foot, extending at least 14" in all directions under roofing and 12" up around the vent pipe. Cap flash pipe and turn down inside 1" approximately. Install all vent pipes extending through roof prior to roof installation. Flashing shall be two-piece type, base and cap flashing. Prior to the roofing installation, furnish base flashing pieces to the Contractor for installation by the Contractor. The Contractor shall install cap flashing.

Stoneman two-piece flashing is permissible as an option to two-piece lead flashing.

Floor drains and floor sinks (which are specified with a flashing clamp) and all job-site built shower pans shall be flashed with 0.40" thick non-plasticized chlorinated polyethylene sheet, Chloraloy 240, as manufactured by Noble Company, or approved equal. Each floor drain and floor sink flashing shall be minimum 36" X 36" square and shall be terminated (if applicable, in corners and against walls) not less than 6" above finish floor.

Lead flashing of floor drains, floor sinks and shower pans will not be permitted.

3.03 FLOOR DRAINS AND FLOOR SINKS

Floor drains and sinks shall be as manufactured by Smith, Wade, Josam or Zurn. Provide flashing clamp devices and flashing where required by floor construction and where specified.

See Plumbing Equipment Specifications for types. All floor drains and sinks shall be installed with grates square with building lines.

3.04 EQUIPMENT DRAINS

The Contractor shall extend drain lines from all equipment requiring drainage, relief valves, reduced pressure backflow preventers, and drain pans to the nearest floor drain or floor sink, or as shown on the drawings, or as directed by the Engineer.

Relief valve drain lines shall be equal in size to the valve outlet port and shall be sloped away from the relief valve.

3.05 TESTS

The entire sanitary waste and vent system shall be tested by filling the entire system or in sections (if required by sequence of construction), with water to provide a minimum of 10 ft. head of water on each system joint and pipe. System shall remain filled with no loss of water and visible leakage for a minimum of four (4) hours. Preliminary testing shall be accomplished as necessary prior to final test.

The Contractor shall certify in writing that all tests were satisfactorily completed before piping was concealed, and shall submit the certification to the Architect for his records, and for transmittal to the Owner.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS

Conform with the applicable provisions of the General Conditions, Special Conditions, and the General Requirements.

1.02 RELATED SECTIONS

Section 15050, General Mechanical Requirements.
Section 15401, Water Supply System (Interior).
Section 15405, Sanitary Drainage System (Interior).

1.03 SCOPE

Plumbing fixtures and equipment shall be supplied, set and connected as shown on the plans, or as recommended by the equipment manufacturer. Fixtures and equipment shall be protected from damage during construction, and shall be thoroughly cleaned of all tape, paint and adhesive prior to final acceptance.

The work included in this contract consists of furnishing all labor, materials, equipment, and tools, to completely install and place in operation the fixtures and equipment described herein.

Equipment and Fixture Connections: The Contractor shall be responsible for rough-in and connection to the equipment furnished by the Owner, by others, or as under the Equipment Sections of this specification. This shall include any equipment requiring connection to domestic hot or cold water systems, direct or indirect waste, or vent piping, whether shown on the Plumbing or Mechanical drawings or not. The Contractor shall coordinate his rough-in work with the Supplier of the equipment actually being furnished, and shall conform to the service requirements of furnished equipment. All final connections required by such equipment shall be made and tested by the Contractor. Carefully review the Architectural drawings for equipment and fixture locations.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES AND EQUIPMENT

Plumbing fixtures and all other plumbing equipment shall be as specified on the plans, or an approved equal.

2.02 QUALITY ASSURANCE

The substitutes of the following manufacturers of fixtures, equipment and material are acceptable to bid against the manufacturers specified. Final acceptance of the substituted equipment is contingent upon review and approval of Rivera Engineering and satisfactory operation when the installation is completed. Rivera Engineering approval shall in no way relieve the manufacturer from complying with all the provisions of the plans (including space requirements) and specifications.

ITEM OF MATERIAL OR EQUIPMENT	APPROVED MANUFACTURER
Plumbing Fixtures	Kohler, American Standard, Eljer, Crane
Access Panels	Zurn, Williams Brothers
Floor Drains, Floor Sinks, Cleanouts, Chair Carriers, Backwater Valves, Air Gap Fittings, Water Hammer Arrestors	Zurn, Wade, Josam, J. R. Smith Ancon
Flush Valves	Sloan, Delany, Zurn - with diaphragm type only
Water Closet Seats	Church, Beneke
Faucets	Chicago Faucet, T & S, Royal, Symmons, Speakman, Fischer, Delta, Bradley, American Standard - Commercial Grade, Kohler - Commercial Grade, Crade - Commercial Grade, Moen
Stops	Kohler, Chicago Faucet, T & S, Royal, McGuire, Sanitary-Dash Note: All submitted stops shall have threaded or sweat inlet connection as specified. No Stops with compression inlet will be accepted as substitution.
Backflow Preventers	Febco, Wilkins, Orion, Watts, Beeco
Electric Water Coolers	Haws, Halsey-Taylor, Oasis, Elkay, Sunrock

2.03 FITTINGS AND PIPES

Fixtures connecting fittings, piping and valves shall be brass or copper and, whenever exposed, shall be polished chrome-plated. Provide tight fitting wall or floor escutcheons of chrome-plated brass wherever pipes pass through floors, walls or ceilings.

Equipment connecting fittings, piping and valves whenever exposed in occupied areas, except in equipment rooms, shall be chrome-plated. Painting shall be as specifically approved by the Architect or Engineer.

All porcelain or vitreous china shall be clean, smooth and bright. All shall be warranted not to craze, discolor or scale.

The Contractor shall furnish and install all required water, waste, soil and vent connections to all plumbing fixtures together with all fittings, supports, fastening devices, cocks, valves, traps, etc., leaving all in complete working order. Provide factory fabricated (or as specified) carriers for all wall hung fixtures.

All automatic or self-closing valves for faucets shall be adjusted in accordance with manufacturer's instructions and supervised as necessary by equipment supplier's representative at the request of the Architect or Engineer. Owner (or others) furnished equipment shall be connected with drains, traps, hot water, cold water and other services required for optimum operation. The Contractor shall obtain information from the Owner or his appointed representative for services required, or field verify specific requirements. The Contractor shall also, prior to bidding, verify what type of connecting material and trim the Contractor shall provide for Owner, or others, furnished equipment.

END OF SECTION

1. GENERAL

1.1 SYSTEM DESCRIPTION

A. The variable capacity, heat pump/heat recovery air conditioning system shall be a SAMSUNG Electronics DVM S (Variable Refrigerant Flow) System. The DVM S systems shall be HR (simultaneous cooling and heating) split system heat recovery or HP (cool/heat) split system heat pump with multiple indoor units.

1.2 PIPING

A. Piping to multiple indoor units requires additional piping components. The VRF equipment manufacturer's Y-joint fittings and/or Heat Recovery Mode Control Units (MCU) must be used to branch the main refrigerant lines.

B. The VRF equipment manufacturer's Tee fittings must be used to connect outdoor units when multiple module systems are being installed (systems with more than one outdoor unit).

1.3 QUALITY ASSURANCE

A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL la bel.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001 which is a set of standards applying to environmental protection set b y the International Standard Organization (ISO).

D. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit. Additional refrigerant is required based on diameters and le ngths of system liquid refrigerant lines and indoor equipment model and quan tity.

E. The installing contractor must have attended Samsung DVM S installation trai ning prior to installing the system.

F. Service and installation manuals must be readily available on the manufactur er's website without entering a username and password.

2. OUTDOOR UNITS

2.1 HEAT RECOVERY CONDENSING UNIT (208/230V, 3Ø)

A. General:

The heat recovery outdoor unit shall be used specifically with SAMSUNG DVM S2 Heat Recovery components. The heat recovery outdoor unit shall consist of the AM***BXVGFR/AA outdoor unit, MCU (Mode Control Unit, MCU-S*NE**N), indoor units (AM****N****/AA models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The heat recovery system shall have the ability of simultaneous heating and cooling operation modes on all indoor units.

2. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 3,000 hours.

3. The heat recovery system shall have the ability to change operation mode (MAIN heating / MAIN cooling) without turning off the compressors allowing for constant heating and cooling operation.

4. The heat recovery system shall have rotational defrost capability (modular systems only) to perform defrost operations while still providing heat to indoor units (operation and conditions restrictions exist).

5. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode. While in heat mode, any defrost cycle lasting over three (3) minutes shall be considered an oil recovery cycle.

6. Advanced intelligent defrost logic to significantly reduce defrost cycle frequency by monitoring air resistance across the condenser coil during heating operation to determine defrost operation initiation to prevent unnecessary defrost cycles.

7. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity as standard. Connection up to 184% is possible under certain design conditions (refer to details in engineering manuals provided by the manufacturer).

8. The heat recovery system shall have installer enabled snow blowing settings to prevent snow accumulation on top of unit.

9. The heat recovery system shall have optional night quite modes to reduce unit sound in evenings reducing fan and/or compressor sound (4 level settings).

10. The heat recovery system shall have current control to limit current (50% - 100% of design current) adjustable at outdoor unit or web accessible, central control devices provided by the VRF manufacturer.

11. The heat recovery system compressors shall be SAMSUNG, hermetically sealed, inverter driven, flash injected, asymmetric, DC scroll type. No fixed capacity compressors will be present in the refrigerant system.

12. Outdoor unit (individual modules) shall have a sound rating no higher than 67 dB (A).

13. All three refrigerant lines from the outdoor unit to the MCU (heat recovery Mode Control Unit) and Y-joints shall be insulated.

14. The heat recovery system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy.

15. The heat recovery outdoor unit shall have an accumulator with ARV (accumulator return valve) control.

16. The heat recovery outdoor unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heating, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

17. The inverter compressor PCB(s) shall be cooled with liquid refrigerant circuit(s) and air-cooling fins to operate at optimal temperatures and to prevent failure due to overheating.

18. The heat recovery outdoor unit shall have the ability to operate with a maximum height difference of 361 feet between the outdoor unit and the lowest indoor unit when the condensing unit is installed higher than the indoor units (with modified piping and PDM kit when greater than 164 feet). The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet between the outdoor unit and the highest indoor unit when the condensing unit is installed lower than the indoor units (conditions apply when over 131). Maximum 3,280 feet total refrigerant tubing length. The greatest length is not to exceed 656 (722 equivalent) feet between outdoor unit and the farthest indoor unit.

19. Indoor units on Heat Recovery systems shall have a maximum vertical separation of 131 feet between the highest and lowest indoor units (maximum 49 feet if connected to the same Mode Control Unit).

20. When using supported MCU (Mode Control Unit) models, indoor units that will be used for cooling only year-round may be piped direct to the liquid and suction pipes bypassing MCU connection.

21. The heat recovery outdoor unit shall be capable of operating in heat mode between -22°F ~ 75°F (-30°C ~ 24°C) ambient temperatures.

22. The heat recovery outdoor unit shall be capable of operating in cool mode between 23°F to 120°F (-5°C to 49°C) ambient temperatures as standard. Cool mode operation between 5°F ~ 122°F (-15°C ~ 50°C) is possible with a modified pipe design.

23. The heat recovery outdoor unit shall be capable of operating in cool mode down to -13°F (-25°C) ambient temperatures with use of low ambient cooling hood and side/rear guard accessories (LACH) to provide 100% cooling capacity.

24. The heat recovery outdoor unit shall have high efficiency, individual oil separator(s) for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

25. The heat recovery outdoor unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

26. The heat recovery outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB

without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

27. The heat recovery outdoor unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the outdoor unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

28. The heat recovery outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

29. The heat recovery outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

30. The heat recovery outdoor unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

31. The heat recovery outdoor unit shall have capability to reduce compressor Hz (heating capacity) further when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode, thus saving energy.

32. The heat recovery outdoor unit shall have capability to reduce compressor Hz (cooling capacity) when average indoor unit ((room temperature – set temperature) < 3.6º F) while operating in cooling mode, thus saving energy.

33. The heat recovery outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

34. In the event of system error due to outdoor unit failure, the heat recovery outdoor unit shall display codes that specify a precise error and which outdoor unit PCB is the cause.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. All fan motors shall be variable speed BLDC type.
2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.
3. All fan motors shall be mounted for quiet operation.
4. All fans shall be provided with a raised guard to prevent contact with moving parts.
5. The heat recovery outdoor unit shall have vertical discharge airflow.
6. The heat recovery outdoor units shall not require any field installed components or component modification to allow ducting of discharge air. Outdoor unit capacities 6 – 14 tons (nominal) shall have the capability for ducting of discharge air up to 0.43" WC static pressure with factory provided dimensional design drawings. Outdoor unit capacities 16 – 20 tons (nominal) shall have the capability for ducting of discharge air up to 0.32" WC static pressure with factory provided dimensional design drawings.

D. Refrigerant

1. R410A refrigerant shall be required for the heat recovery outdoor systems.
2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.
3. Modular systems shall require outdoor refrigerant kits for module connection provided by the manufacturer.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 2,280 hours.

3. The coil shall be protected with an integral metal guard.

4. The heat exchanger shall consist of two separate circuits to enhance the heat pump defrost cycle. The unit shall use the entire coil initially for the defrost cycle. To resume heating faster in extreme conditions, the upper section shall return to heating operation while the lower section continues to defrost.

F. Compressor:

1. The compressors shall have flash injection capability to increase performance in heating mode only. This will be automatically enabled by the outdoor unit(s) by forcing saturated refrigerant as a liquid flash mix directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without flash injection shall not be present in the VRF heat recovery system.

2. All compressors shall be modulation capable, flash injected, DC inverter, scroll type.

3. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable, vapor injected, DC inverter, scroll compressor.

4. Crankcase heaters shall be factory mounted on the compressors. For units without crankcase heaters, the compressors shall be warmed by the compressor inverter control PCB and motor windings.

5. The outdoor unit compressor shall have variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

6. The outdoor unit compressor(s) shall have flash injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing temperatures resulting in a capacity and performance improvement in heating mode. Compressors without flash injection shall not be present in the VRF heat recovery system.

7. The compressor(s) will be equipped with an internal thermal overload.

8. The compressor(s) shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 3 phase, 60 hertz.

2. The 208/230 VAC outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).

3. The outdoor unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units, MCU (Mode Control Unit) and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system (F1/F2).

2.2 HEAT RECOVERY CONDENSING UNIT (460V, 3Ø)

A. General:

The heat recovery outdoor unit shall be used specifically with SAMSUNG DVM S2 Heat Recovery components. The heat recovery outdoor unit shall consist of the AM***BXVGJR/AA outdoor unit, MCU (Mode Control Unit, MCU-S*NE**N), indoor units (AM****N****/AA models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The heat recovery system shall have the ability of simultaneous heating and cooling operation modes on all indoor units.

2. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 3,000 hours.

3. The heat recovery system shall have the ability to change operation mode (MAIN heating / MAIN cooling) without turning off the compressors allowing for constant heating and cooling operation.

4. The heat recovery system shall have rotational defrost capability (modular systems only) to perform defrost operations while still providing heat to indoor units (operation and conditions restrictions exist).

5. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode. While in heat mode, any defrost cycle lasting over three (3) minutes shall be considered an oil recovery cycle.

6. Advanced intelligent defrost logic to significantly reduce defrost cycle frequency by monitoring air resistance across the condenser coil during heating operation to determine defrost operation initiation to prevent unnecessary defrost cycles.

7. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity as standard. Connection up to 184% is possible under certain design conditions (refer to details in engineering manuals provided by the manufacturer).

8. The heat recovery system shall have installer enabled snow blowing settings to prevent snow accumulation on top of unit.

9. The heat recovery system shall have optional night quite modes to reduce unit sound in evenings reducing fan and/or compressor sound (4 level settings).

10. The heat recovery system shall have current control to limit current (50% - 100% of design current) adjustable at outdoor unit or web accessible, central control devices provided by the VRF manufacturer.

11. The heat recovery system compressors shall be SAMSUNG, hermetically sealed, inverter driven, flash injected, asymmetric, DC scroll type. No fixed capacity compressors will be present in the refrigerant system.

12. Outdoor unit (individual modules) shall have a sound rating no higher than 67 dB (A).

13. All three refrigerant lines from the outdoor unit to the MCU (heat recovery Mode Control Unit) and Y-joints shall be insulated.

14. The heat recovery system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy.

15. The heat recovery outdoor unit shall have an accumulator with ARV (accumulator return valve) control.

16. The heat recovery outdoor unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heating, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

17. The inverter compressor PCB(s) shall be cooled with liquid refrigerant cir cuit(s) and air-cooling fins to operate at optimal temperatures and to prev ent failure due to overheating.

18. The heat recovery outdoor unit shall have the ability to operate with a maximum height difference of 361 feet between the outdoor unit and the lowest indoor unit when the condensing unit is installed higher than the indoor units (with modified piping and PDM kit when greater than 164 feet). The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet between the outdoor unit and the highest indoor unit when the condensing unit is installed lower than the indoor units (conditions apply when over 131). Maximum 3,280 feet total refrigerant tubing length. The greatest length is not to exceed 656 (722 equivalent) feet between outdoor unit and the farthest indoor unit.

19. Indoor units on Heat Recovery systems shall have a maximum vertical separation of 131 feet between the highest and lowest indoor units (maximum 49 feet if connected to the same Mode Control Unit).

20. When using supported MCU (Mode Control Unit) models, indoor units th at will be used for cooling only year-round may be piped direct to the liqu id and suction pipes bypassing MCU connection.

21. The heat recovery outdoor unit shall be capable of operating in heat mode between -22°F ~ 75°F (-30°C ~ 24°C) ambient temperatures.

22. The heat recovery outdoor unit shall be capable of operating in cool mode between 23°F to 120°F (-5°C to 49°C) ambient temperatures as standard. Cool mode operation between 5°F ~ 122°F (-15°C ~ 50°C) is possible with a modified pipe design.

23. The heat recovery outdoor unit shall be capable of operating in cool mode down to -13°F (-25°C) ambient temperatures with use of low ambient cooling hood and side/rear guard accessories (LACH) to provide 100% cooling capacity.

24. The heat recovery outdoor unit shall have high efficiency, individual oil separator(s) for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

25. The heat recovery outdoor unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

26. The heat recovery outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

27. The heat recovery outdoor unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the outdoor unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

28. The heat recovery outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

29. The heat recovery outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

30. The heat recovery outdoor unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

31. The heat recovery outdoor unit shall have capability to reduce compressor Hz (heating capacity) further when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode, thus saving energy.

32. The heat recovery outdoor unit shall have capability to reduce compressor Hz (cooling capacity) when average indoor unit ((room temperature – set temperature) < 3.6º F) while operating in cooling mode, thus saving energy.

33. The heat recovery outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

34. In the event of system error due to outdoor unit failure, the heat recovery outdoor unit shall display codes that specify a precise error and which outdoor unit PCB is the cause.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. All fan motors shall be variable speed BLDC type.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The heat recovery outdoor unit shall have vertical discharge airflow.

6. The heat recovery outdoor units shall not require any field installed components or component modification to allow ducting of discharge air. Outdoor unit capacities 6 – 14 tons (nominal) shall have the capability for ducting of discharge air up to 0.43" WC static pressure with factory provided dimensional design drawings. Outdoor unit capacities 16 – 20 tons (nominal) shall have the capability for ducting of discharge air up to 0.32" WC static pressure with factory provided dimensional design drawings.

D. Refrigerant

1. R410A refrigerant shall be required for the heat recovery outdoor systems.

2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems shall require outdoor refrigerant kits for module connection provided by the manufacturer

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 2,280 hours.

3. The coil shall be protected with an integral metal guard.

4. The heat exchanger shall consist of two separate circuits to enhance the heat pump defrost cycle. The unit shall use the entire coil initially for the defrost cycle. To resume heating faster in extreme conditions, the upper section shall return to heating operation while the lower section continues to defrost.

F. Compressor:

1. The compressors shall have flash injection capability to increase performance in heating mode only. This will be automatically enabled by the outdoor unit(s) by forcing saturated refrigerant as a liquid flash mix directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without flash injection shall not be present in the VRF heat recovery system.

2. All compressors shall be modulation capable, flash injected, DC inverter, scroll type.

3. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable, vapor injected, DC inverter, scroll compressor.

4. Crankcase heaters shall be factory mounted on the compressors. For units without crankcase heaters, the compressors shall be warmed by the compressor inverter control PCB and motor windings.

5. The outdoor unit compressor shall have variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

6. The outdoor unit compressor(s) shall have flash injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing temperatures resulting in a capacity and performance improvement in heating mode. Compressors without flash injection shall not be present in the VRF heat recovery system.

7. The compressor(s) will be equipped with an internal thermal overload.

8. The compressor(s) shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 460 Volts, 3 phase, 60 hertz.

2. The outdoor unit shall be controlled by integral microprocessors.

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system (F1/F2).

2.3 LOW AMBIENT HEATING (MAX HEAT), HEAT RECOVERY CONDENSING UNIT (208/230V, 3Ø)

A. General:

The heat recovery outdoor unit shall be used specifically with SAMSUNG DVM S Heat Recovery components. The heat recovery outdoor unit shall consist of the AM***KXVTFR/AA outdoor unit, MCU (Mode Control Unit, MCU-S*NE**N), indoor units (AM****N**CH** models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The AM***KXVTFR/AA outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The low ambient heating heat recovery outdoor shall perform as noted bel ow at -13°F outside ambient temperature.

Capacity at -13°F OA (70°F DB indoor)		
System Model Number	***Design Diversity (Capacity Ratio)***	
	100%	***130%***
AM072KXVTFR/AA	81,000	93,200
AM096KXVTFR/AA	108,000	124,300
AM144KXVTFR/AA	162,000	186,400
AM168KXVTFR/AA	189,000	217,500
AM192KXVTFR/AA	216,000	248,600
AM216KXVTFR/AA	243,000	279,600
AM240KXVTFR/AA	270,000	310,700
AM264KXVTFR/AA	297,000	341,800
AM288KXVTFR/AA	324,000	372,900

2. The heat recovery system shall have the ability of simultaneous heating and cooling operation modes on all indoor units.

3. The Heat Recovery condensing unit salt spray test method: ASTM B117-1 8 –

   the heat exchanger showed no unusual rust or corrosion development to 2280hours.

4. The heat recovery system shall have the ability to change operation mode (MAIN heating / MAIN cooling) without turning off the compressors allowing for constant heating and cooling operation.

5. The heat recovery system shall have rotational defrost capability (modular systems only) to perform defrost operations while still providing heat to indoor units (operation and conditions restrictions exist).

6. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode. While in heat mode, any defrost cycle lasting over three (3) minutes shall be considered an oil recovery cycle.

7. Advanced intelligent defrost logic to significantly reduce defrost cycle frequency by monitoring air resistance across the condenser coil during heating operation to determine defrost operation initiation to prevent unnecessary defrost cycles (applies to models manufactured after 2014).

8. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity.

9. The heat recovery system shall have installer enabled snow blowing settings to prevent snow accumulation on top of unit.

10. The heat recovery system shall have optional night quite modes to reduce unit sound in evenings reducing fan and/or compressor sound (4 level settings).

11. The heat recovery system shall have current control to limit current (50% - 100% of design current) adjustable at outdoor unit or web accessible, central control devices provided by the VRF manufacturer.

12. The heat recovery system compressors shall be SAMSUNG, hermetically sealed, inverter driven, direct flash injected, asymmetric, DC scroll type. No fixed capacity compressors will be present in the refrigerant system.

13. Outdoor unit (individual modules) shall have a sound rating no higher than 64 dB (A).

14. All three refrigerant lines from the outdoor unit to the MCU (heat recovery Mode Control Unit) and Y-joints shall be insulated.

15. The heat recovery system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy

16. The heat recovery outdoor unit shall have an accumulator with ARV (accumulator return valve) control.

17. The heat recovery outdoor unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heaters, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

18. The inverter compressor PCB(s) shall be cooled with liquid refrigerant circuit(s) to operate at optimal temperatures and to prevent failure due to overheating. No compressor inverter PCBs shall be cooled by air over heat sink exclusively. Cooling inverter components without air-cooling fins prevents failure due to environmental contaminants.

19. The heat recovery outdoor unit shall have the ability to operate with a maximum height difference of 361 feet with the condensing unit installed higher than the indoor units (with modified piping and PDM kit when greater than 164 feet). The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet with the condensing unit installed lower than the indoor units (conditions apply when over 131). Maximum 3,280 feet total refrigerant tubing length. The greatest length is not to exceed 656 (722 equivalent) feet between outdoor unit and the farthest indoor unit.

19. Indoor units on heat recovery systems shall have a maximum vertical separation of 131 feet (maximum 49 feet if connected to the same Mode Control Unit).

20. When using supported MCU (Mode Control Unit) models, indoor units th at will be used for cooling only year-round may be piped direct to the liqu id and suction pipes bypassing MCU connection.

21. The heat recovery outdoor unit shall be capable of operating in heat mode between -13°F ~ 75°F (-25°C ~ 24°C) ambient temperatures.

22. The heat recovery outdoor unit shall be able to provide 100% heating capacity at -13°F (-25°C) outside ambient temperatures (no degradation of capacity down to -13°F (-25°C) due to outside ambient temperature).

23. The heat recovery outdoor unit shall be capable of operating in cool mode between 23°F to 120°F (-5°C to 49°C) ambient temperatures as standard. Cool mode operation between 5°F ~ 120°F (-15°C ~ 49°C) is possible with a modified pipe design.

24. The heat recovery outdoor unit shall be capable of operating in cool mode down to -13°F (-25°C) ambient temperatures with use of low ambient cooling hood and side/rear guard accessories (LACH) to provide 100% cooling capacity.

25. The heat recovery outdoor unit shall have high efficiency, individual oil separator(s) for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

26. The heat recovery outdoor unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

27. The heat recovery outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be

viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

28. The heat recovery outdoor unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the outdoor unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

29. The heat recovery outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

30. The heat recovery outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

31. The heat recovery outdoor unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

32. The heat recovery outdoor unit shall have capability to reduce compressor Hz (heating capacity) further when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode, thus saving energy.

33. The heat recovery outdoor unit shall have capability to reduce compressor Hz (cooling capacity) when average indoor unit ((room temperature – set temperature) < 3.6º F) while operating in cooling mode, thus saving energy.

34. The heat recovery outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

35. In the event of system error due to outdoor unit failure, the heat recovery outdoor unit shall display codes that specify a precise error and which outdoor unit PCB is the cause.

36. The heat recovery system shall support system auto-addressing allowing system commissioning without manually configuring indoor unit addresses.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. All fan motors shall be variable speed BLDC type.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The heat recovery outdoor unit shall have vertical discharge airflow.

6. The heat recovery outdoor units shall have the capability for ducting of discharge air up to 0.32" WC static pressure with factory provided dimensional design drawings. The heat recovery outdoor units shall not require any field installed components or component modification to allow ducting of discharge air.

D. Refrigerant

1. R410A refrigerant shall be required for the heat recovery outdoor systems.

2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems shall require outdoor refrigerant kits for module connection provided by the manufacturer.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 2280 hours.

3. The coil shall be protected with an integral metal guard.

4. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable, flash injected, DC inverter, scroll compressor.

F. Compressor:

1. The compressors shall have flash injection capability to increase performance in heating mode only. This will be automatically enabled by the outdoor unit(s) by forcing saturated refrigerant as a liquid flash mix directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without flash injection shall not be present in the VRF heat recovery system.

2. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable, flash injected, DC inverter, scroll compressor.

3. All compressors shall be modulation capable, direct flash injected, DC inverter, scroll type.

4. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable flash injection scroll compressor.

5. Crankcase heaters shall be factory mounted on the compressors.

6. The outdoor unit compressor shall have variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

7. The outdoor unit compressor(s) shall have flash injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing temperatures resulting in a capacity and performance improvement in heating and cooling modes. Compressors without flash injection shall not be present in the VRF heat recovery system.

8. The compressor(s) will be equipped with an internal thermal overload.

9. The compressor(s) shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 3 phase, 60 hertz.

2. The 208/230 VAC outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).

3. The outdoor unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units, MCU (Mode Control Unit) and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system (F1/F2).

2.4 LOW AMBIENT HEATING (MAX HEAT), HEAT RECOVERY CONDENSING UNIT (460V, 3Ø)

A. General:

The heat recovery outdoor unit shall be used specifically with SAMSUNG DVM S Heat Recovery components. The heat recovery outdoor unit shall consist of the AM***KXVTJR/AA outdoor unit, MCU (Mode Control Unit, MCU-S*NE**N), indoor units (AM****N**CH** models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The AM***KXVTJR/AA outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The low ambient heating heat recovery outdoor shall perform as noted bel ow at -13°F outside ambient temperature.

Capacity at -13°F OA (70°F DB indoor)		
System Model Number	***Design Diversity (Capacity Ratio)***	
	100%	***130%***
AM072KXVTJR/AA	81,000	93,200
AM096KXVTJR/AA	108,000	124,300

Capacity at -13°F OA (70°F DB indoor)		
System Model Number	Design Diversity (Capacity Ratio)	
	100%	130%
AM144KXVTJR/AA	162,000	186,400
AM168KXVTJR/AA	189,000	217,500
AM192KXVTJR/AA	216,000	248,600
AM216KXVTJR/AA	243,000	279,600
AM240KXVTJR/AA	270,000	310,700
AM264KXVTJR/AA	297,000	341,800
AM288KXVTJR/AA	324,000	372,900

2. The heat recovery system shall have the ability of simultaneous heating and cooling operation modes on all indoor units.

3. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 –

   the heat exchanger showed no unusual rust or corrosion development to 2280hours.

4. The heat recovery system shall have the ability to change operation mode (MAIN heating / MAIN cooling) without turning off the compressors allowing for constant heating and cooling operation.

5. The heat recovery system shall have rotational defrost capability (modular systems only) to perform defrost operations while still providing heat to indoor units (operation and conditions restrictions exist).

6. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode. While in heat mode, any defrost cycle lasting over three (3) minutes shall be considered an oil recovery cycle.

7. Advanced intelligent defrost logic to significantly reduce defrost cycle frequency by monitoring air resistance across the condenser coil during heating operation

to determine defrost operation initiation to prevent unnecessary defrost cycles (applies to models manufactured after 2014).

8. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity.

9. The heat recovery system shall have installer enabled snow blowing settings to prevent snow accumulation on top of unit.

10. The heat recovery system shall have optional night quite modes to reduce unit sound in evenings reducing fan and/or compressor sound (4 level settings).

11. The heat recovery system shall have current control to limit current (50% - 100% of design current) adjustable at outdoor unit or web accessible, c entral control devices provided by the VRF manufacturer.

12. The heat recovery system compressors shall be SAMSUNG, hermetically sealed, inverter driven, direct flash injected, asymmetric, DC scroll type. No fixed capacity compressors will be present in the refrigerant system.

13. Outdoor unit (individual modules) shall have a sound rating no higher than 64 dB (A).

14. All three refrigerant lines from the outdoor unit to the MCU (heat recover y Mode Control Unit) and Y-joints shall be insulated.

15. The heat recovery system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy

16. The heat recovery outdoor unit shall have an accumulator with ARV (accumulator return valve) control.

17. The heat recovery outdoor unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heaters, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

18. The inverter compressor PCB(s) shall be cooled with liquid refrigerant circuit(s) to operate at optimal temperatures and to prevent failure due to overheating. No compressor inverter PCBs shall be cooled by air over heat sink exclusively.

Cooling inverter components without air-cooling fins prevents failure due to environmental contaminants.

19. The heat recovery outdoor unit shall have the ability to operate with a maximum height difference of 361 feet with the condensing unit installed higher than the indoor units (with modified piping and PDM kit when greater than 164 feet). The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet with the condensing unit installed lower than the indoor units (conditions apply when over 131). Maximum 3,280 feet total refrigerant tubing length. The greatest length is not to exceed 656 (722 equivalent) feet between outdoor unit and the farthest indoor unit.

20. Indoor units on heat recovery systems shall have a maximum vertical separation of 131 feet (maximum 49 feet if connected to the same Mode Control Unit).

21. When using supported MCU (Mode Control Unit) models, indoor units that will be used for cooling only year-round may be piped direct to the liquid and suction pipes bypassing MCU connection.

22. The heat recovery outdoor unit shall be capable of operating in heat mode between -13°F ~ 75°F (-25°C ~ 24°C) ambient temperatures.

23. The heat recovery outdoor unit shall be able to provide 100% heating capacity at -13°F (-25°C) outside ambient temperatures (no degradation of capacity down to -13°F (-25°C) due to outside ambient temperature).

24. The heat recovery outdoor unit shall be capable of operating in cool mode between 23°F to 120°F (-5°C to 49°C) ambient temperatures as standard. Cool mode operation between 5°F ~ 120°F (-15°C ~ 49°C) is possible with a modified pipe design.

25. The heat recovery outdoor unit shall be capable of operating in cool mode down to -13°F (-25°C) ambient temperatures with use of low ambient cooling hood and side/rear guard accessories (LACH) to provide 100% cooling capacity.

26. The heat recovery outdoor unit shall have high efficiency, individual oil separator(s) for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

27. The heat recovery outdoor unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

28. The heat recovery outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

29. The heat recovery outdoor unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the outdoor unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

30. The heat recovery outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

31. The heat recovery outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

32. The heat recovery outdoor unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

33. The heat recovery outdoor unit shall have capability to reduce compressor Hz (heating capacity) further when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode, thus saving energy.

34. The heat recovery outdoor unit shall have capability to reduce compressor Hz (cooling capacity) when average indoor unit ((room temperature – set temperature) < 3.6º F) while operating in cooling mode, thus saving energy.

35. The heat recovery outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

36. In the event of system error due to outdoor unit failure, the heat recovery outdoor unit shall display codes that specify a precise error and which outdoor unit PCB is the cause.

37. The heat recovery system shall support system auto-addressing allowing system commissioning without manually configuring indoor unit addresses.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. All fan motors shall be variable speed BLDC type.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The heat recovery outdoor unit shall have vertical discharge airflow.

6. The heat recovery outdoor units shall have the capability for ducting of discharge air up to 0.32" WC static pressure with factory provided dimensional design drawings. The heat recovery outdoor units shall not require any field installed components or component modification to allow ducting of discharge air.

D. Refrigerant

1. R410A refrigerant shall be required for the heat recovery outdoor systems.

2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems shall require outdoor refrigerant kits for module connection provided by the manufacturer.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 2280 hours.

3. The coil shall be protected with an integral metal guard.

F. Compressor:

1. The compressors shall have flash injection capability to increase performance in heating mode only. This will be automatically enabled by the outdoor unit(s) by forcing saturated refrigerant as a liquid flash mix directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without flash injection shall not be present in the VRF heat recovery system.

2. All compressors shall be modulation capable, direct flash injected, DC inverter, scroll type.

3. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable, flash injected, DC inverter, scroll compressor.

4. Crankcase heaters shall be factory mounted on the compressors.

5. The outdoor unit compressor shall have variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

6. The outdoor unit compressor(s) shall have flash injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing temperatures resulting in a capacity and performance improvement in heating and cooling modes. Compressors without flash injection shall not be present in the VRF heat recovery system.

7. The compressor(s) will be equipped with an internal thermal overload.

8. The compressor(s) shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 460 Volts, 3 phase, 60 hertz.

2. The outdoor unit shall be controlled by integral microprocessors.

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system (F1/F2).

2.5 HEAT PUMP / HEAT RECOVERY WATER-SOURCE CONDENSING UNIT (208/230V, 3Ø)

A. General:

The heat pump/heat recovery water-source unit shall be used specifically with SAMSUNG DVM S Heat Recovery components. The heat pump/heat recovery water-source unit shall consist of the AM***HXWAFR*AA water-source unit, MCU (Mode Control Unit, MCU-S*NE**N), indoor units (AM****N**CH** models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The AM***HXWAFR*AA water-source units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The water-source unit shall have a powder coated finish. The water-source unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The heat recovery system shall have the ability of simultaneous heating and cooling operation modes on all indoor units when configured and installed as a heat recovery system.

2. The heat pump/heat recovery system shall have the ability to change operation mode (MAIN heating / MAIN cooling) without turning off the compressors allowing for constant heating and cooling operation.

3. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes

while in heating mode.

4. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity.

5. The heat pump/heat recovery system shall have current control to limit current (50% - 100% of design current) adjustable at water-source unit or central web accessible, control devices: MIM-D01AUN, MIM-B17BUN, or MIM-B18BUN.

6. The heat pump/heat recovery system compressors shall be SAMSUNG, hermetically sealed, inverter driven, direct vapor injected, asymmetric, DC scroll type. No fixed capacity compressors shall be present in the refrigerant system.

7. The water-source unit (individual modules) shall have a sound rating no higher than 51 dB (A).

8. All three refrigerant lines from the water-source unit to the MCU (heat recovery Mode Change Unit) shall be insulated.

9. The heat pump/heat recovery system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy.

10. The heat pump/heat recovery water-source unit shall have an accumulator with ARV (accumulator return valve) control.

11. The heat pump/heat recovery water-source unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, low pressure protection, compressor overcurrent protection, current transformer(s), crank case heaters, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

12. The inverter compressor PCB(s) shall be cooled with liquid refrigerant circuit(s) to operate at optimal temperatures and to prevent failure due to overheating. No compressor inverter PCBs shall be cooled by air over heat sink exclusively. Cooling inverter components without air-cooling fins prevents failure due to environmental contaminants.

13. The heat pump/heat recovery water-source unit shall have the ability to operate with a maximum height difference of 164 feet with the water-source unit installed higher than the indoor units or 131 feet with the condensers installed lower than the indoor units and have total refrigerant tubing length of

984 feet. The greatest length is not to exceed 558 (623 equivalent) feet between water-source unit and the farthest indoor unit.

14. The heat pump/heat recovery water-source unit shall be capable of operating in ambient temperatures between 32°F ~ 104°F (0°C ~ 40°C).

15. The heat pump/heat recovery water-source unit shall be installed in a dry location.

16. The heat pump/heat recovery water-source unit shall have high efficiency, individual oil separator(s) for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

17. The heat pump/heat recovery water-source unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

18. The compressors shall have vapor injection capability to increase performance in both heating and cooling modes. This will be automatically enabled by the water-source unit(s) by forcing saturated refrigerant vapor directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without vapor injection shall not be present in the VRF heat pump/heat recovery system.

19. The heat pump/heat recovery water-source unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the water-source unit EEPROM shall be viewable from the manufacturer provided service software. The water-source unit main EEPROM shall be removable allowing replacement of water-source unit PCB without losing digital, field programmed data. The water-source unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

20. The heat pump/heat recovery water-source unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the water-source unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

21. The heat pump/heat recovery water-source unit shall have water-source unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of water-source unit chassis while performing service.

22. The heat pump/heat recovery water-source unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in a water-source unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within a water-source unit chassis.

23. The heat pump/heat recovery water-source unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

24. When configured as a heat recovery system and using supported MCU (Mode Control Unit) models, indoor units that will be used for cooling only year-round may be piped direct to the liquid and suction pipes bypassing MCU connection.

25. When configured as heat recovery, indoor units shall have a maximum vertical separation of 131 feet (maximum 49 feet if connected to the same Mode Control Unit).

26. The heat pump/heat recovery water-source unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

27. In the event of system error due to water-source unit failure, the heat pump/heat recovery water-source unit shall display codes that specify a precise error and which water-source unit PCB is the cause (main PCB, HUB PCB, IPM 1, IPM 2).

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Refrigerant

1. R410A refrigerant shall be required for the pump/heat recovery water-source unit.

2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems (more than one water-source unit) shall require outdoor refrigerant kits for module connection provided by the equipment manufacturer.

D. Heat Exchanger:

1. The water-source unit heat exchanger shall be a stainless steel brazed plate heat exchanger.

E. Compressor:

1. All compressors shall be modulation capable, direct vapor injected, DC i nverter, scroll type.

2. Refrigerant flow from the water-source unit shall be controlled by means of capacity modulation capable, vapor injected, DC inverter, scroll compr essor.

3. Crankcase heaters shall be factory mounted on the compressors.

4. The water-source unit compressor shall have variable modulation technolo gy to modulate capacity. System capacity shall be completely variable do wn to 7,513 Btu/h.

5. The water-source unit compressor(s) shall have vapor injection technology which can increase the mass flow rate of refrigerant and offset refrigera nt condensing temperatures resulting in a capacity and performance impr ovement in heating and cooling modes. Compressors without vapor inject ion shall not be present in the VRF heat pump/heat recovery system.

6. The compressor(s) will be equipped with an internal thermal overload.

7. The compressor(s) shall be mounted to avoid the transmission of vibratio n.

F. Water System:

1. The circulating water must meet the VRF manufacturer's specification an d recommendations.

2. The water pipe system shall be closed loop. If hydrothermal or open c ooling towers are used, additional heat exchangers must be installed In order to keep condenser water supply isolated from brazed plate heat e xchanger (BPHX).

3. The water-source unit shall have a dry contact to enable/disable a 2-wa y solenoid valve. A high voltage output shall also be available from the water-source unit (0.2A, 250V max) to operate a 2-way solenoid valve.

4. The water-source unit shall have a 0V – 10V output to operate a flow c ontrol valve.

5. The water-source unit shall have a dry contact available to operate exte rnal water pumps.

6. The water system shall have a maximum working pressure of 285 PSI.

7. Water system inlet temperatures shall be within the temperatures noted b elow.

Type	***Circulating Water***	***Operation***	***Inlet Water Temperature [1]***	
			Standard Usage Range	***Usage Range Limit***
Heat Source Water	Water Loop	Cooling	68°F – 95°F (20°C ~ 35°C)	50°F – 113°F (10°C ~ 45°C)
		Heating		
Ground Heat Source	Ground Loop	Cooling	59°F – 95°F (13°C ~ 35°C)	50°F – 113°F (10°C ~ 45°C)
		Heating	41°F – 77°F (5°C ~ 25°C)	23°F – 113°F (-5°C ~ 45°C) 14°F – 113°F[2]

Type	***Circulating Water***	***Operation***	***Inlet Water Temperature*** [1]	
			Standard Usage Range	***Usage Range Limit***
				(-10°C ~ 45°C[2])

[1] When inlet water temperature is below 50°F (10°C), appropriate anti-freeze protection must be used according the manufacturer's guidelines.

[2] Strict management of anti-freezing concentration level is required. Consult the VRF manufacturer before application.

G. Electrical:

1. The water-source unit electrical power shall be 208/230 volts, 3 phase, 60 hertz.

2. The 208/230 VAC water-source unit shall be capable of satisfactory oper ation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (23 0V/60Hz).

3. The water-source unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units, MCU (Mode Control Unit) a nd the water-source unit shall be 0.5VDC - 7VDC completed using stran ded, annealed copper conductor, two-core, 16 AWG, shielded cable to pr ovide total integration of the system (F1/F2).

2.6 HEAT PUMP / HEAT RECOVERY WATER-SOURCE CONDENSING UNIT (460V, 3Ø)

A. General:

The heat pump/heat recovery water-source unit shall be used specifically with SAMSUNG DVM S Heat Recovery components. The heat pump/heat recovery water-source unit shall consist of the AM***HXWAJR*AA water-source unit, MCU (Mode Control Unit, MCU-S*NE**N), indoor units (AM****N**CH** models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The AM***HXWAJR*AA water-source units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The water-source unit shall have a powder coated finish. The water-source unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The heat recovery system shall have the ability of simultaneous heating and cooling operation modes on all indoor units when configured and installed as a heat recovery system.

2. The heat pump/heat recovery system shall have the ability to change operation mode (MAIN heating / MAIN cooling) without turning off the compressors allowing for constant heating and cooling operation.

3. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode.

4. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity.

5. The heat pump/heat recovery system shall have current control to limit current (50% - 100% of design current) adjustable at water-source unit or central web accessible, control devices: MIM-D01AUN, MIM-B17BUN, or MIM-B18BUN.

6. The heat pump/heat recovery system compressors shall be SAMSUNG, hermetically sealed, inverter driven, direct vapor injected, asymmetric, DC scroll type. No fixed capacity compressors shall be present in the refrigerant system.

7. The water-source unit (individual modules) shall have a sound rating no higher than 51 dB (A).

8. All three refrigerant lines from the water-source unit to the MCU (heat recovery Mode Change Unit) shall be insulated.

9. The heat pump/heat recovery system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy.

10. The heat pump/heat recovery water-source unit shall have an accumulator with ARV (accumulator return valve) control.

11. The heat pump/heat recovery water-source unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, low pressure protection, compressor overcurrent protection, current transformer(s), crank case heaters, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

12. The inverter compressor PCB(s) shall be cooled with liquid refrigerant circuit(s) to operate at optimal temperatures and to prevent failure due to overheating. No compressor inverter PCBs shall be cooled by air over heat sink exclusively. Cooling inverter components without air-cooling fins prevents failure due to environmental contaminants.

13. The heat pump/heat recovery water-source unit shall have the ability to operate with a maximum height difference of 164 feet with the water-source unit installed higher than the indoor units or 131 feet with the condensers installed lower than the indoor units and have total refrigerant tubing length of 984 feet. The greatest length is not to exceed 558 (623 equivalent) feet between water-source unit and the farthest indoor unit.

14. The heat pump/heat recovery water-source unit shall be capable of operating in ambient temperatures between 32°F ~ 104°F (0°C ~ 40°C).

15. The heat pump/heat recovery water-source unit shall be installed in a dry location.

16. The heat pump/heat recovery water-source unit shall have high efficiency, individual oil separator(s) for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

17. The heat pump/heat recovery water-source unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

18. The compressors shall have vapor injection capability to increase performance in both heating and cooling modes. This will be automatically enabled by the water-source unit(s) by forcing saturated refrigerant vapor directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without vapor injection shall not be present in the VRF heat pump/heat recovery system.

19. The heat pump/heat recovery water-source unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the water-source

unit EEPROM shall be viewable from the manufacturer provided service software. The water-source unit main EEPROM shall be removable allowing replacement of water-source unit PCB without losing digital, field programmed data. The water-source unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

20. The heat pump/heat recovery water-source unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the water-source unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

21. The heat pump/heat recovery water-source unit shall have water-source unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of water-source unit chassis while performing service.

22. The heat pump/heat recovery water-source unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in a water-source unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within a water-source unit chassis.

23. The heat pump/heat recovery water-source unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

24. When configured as a heat recovery system and using supported MCU (Mode Control Unit) models, indoor units that will be used for cooling only year-round may be piped direct to the liquid and suction pipes bypassing MCU connection.

25. When configured as heat recovery, indoor units shall have a maximum vertical separation of 131 feet (maximum 49 feet if connected to the same Mode Control Unit).

26. The heat pump/heat recovery water-source unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

27. In the event of system error due to water-source unit failure, the heat pump/heat recovery water-source unit shall display codes that specify a precise error and which water-source unit PCB is the cause (main PCB, HUB PCB, IPM 1, IPM 2).

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Refrigerant

1. R410A refrigerant shall be required for the pump/heat recovery water-source unit.

2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems (more than one water-source unit) shall require outdoor refrigerant kits for module connection provided by the equipment manufacturer.

D. Heat Exchanger:

1. The water-source unit heat exchanger shall be a stainless steel brazed plate heat exchanger.

E. Compressor:

1. All compressors shall be modulation capable, direct vapor injected, DC i nverter, scroll type.

2. Refrigerant flow from the water-source unit shall be controlled by means of capacity modulation capable, vapor injected, DC inverter, scroll compr essor.

3. Crankcase heaters shall be factory mounted on the compressors.

4. The water-source unit compressor shall have variable modulation technolo gy to modulate capacity. System capacity shall be completely variable do wn to 7,513 Btu/h.

5. The water-source unit compressor(s) shall have vapor injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing temperatures resulting in a capacity and performance improvement in heating and cooling modes. Compressors without vapor injection shall not be present in the VRF heat pump/heat recovery system.

6. The compressor(s) will be equipped with an internal thermal overload.

7. The compressor(s) shall be mounted to avoid the transmission of vibration.

F. Water System:

1. The circulating water must meet the VRF manufacturer's specification and recommendations.

2. The water pipe system shall be closed loop. If hydrothermal or open cooling towers are used, additional heat exchangers must be installed In order to keep condenser water supply isolated from brazed plate heat exchanger (BPHX).

3. The water-source unit shall have a dry contact to enable/disable a 2-way solenoid valve. A high voltage output shall also be available from the water-source unit (0.2A, 250V max) to operate a 2-way solenoid valve.

4. The water-source unit shall have a 0V – 10V output to operate a flow control valve.

5. The water-source unit shall have a dry contact available to operate external water pumps.

6. The water system shall have a maximum working pressure of 285 PSI.

7. Water system inlet temperatures shall be within the temperatures noted below.

Type	***Circulating Water***	***Operation***	***Inlet Water Temperature [1]***	
			Standard Usage Range	***Usage Range Limit***
Heat Source Water	Water Loop	Cooling	68°F – 95°F (20°C ~ 35°C)	50°F – 113°F (10°C ~ 45°C)
		Heating		
Ground Heat Source	Ground Loop	Cooling	59°F – 95°F (13°C ~ 35°C)	50°F – 113°F (10°C ~ 45°C)
		Heating	41°F – 77°F (5°C ~ 25°C)	23°F – 113°F (-5°C ~ 45°C) 14°F – 113°F[2] (-10°C ~ 45°C[2])

[1] When inlet water temperature is below 50°F (10°C), appropriate anti-freeze protection must be used according the manufacturer's guidelines.

[2] Strict management of anti-freezing concentration level is required. Consult the VRF manufacturer before application.

G. Electrical:

1. The water-source unit electrical power shall be 60 Volts, 3 phase, 60 he rtz.

2. The water-source unit shall be controlled by integral microprocessors.

3. The control circuit between the indoor units, MCU (Mode Control Unit) a nd the water-source unit shall be 0.5VDC - 7VDC completed using stran ded, annealed copper conductor, two-core, 16 AWG, shielded cable to pr ovide total integration of the system (F1/F2).

2.7 DVM S ECO HEAT RECOVERY CONDENSING UNIT (208/230V, 1Ø)

A. The heat recovery system shall consist of an AM0**NXMDCR/AA outdoor unit, multiple indoor units (AM****N****/AA), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The AM0**NXMDCR/AA outdoor unit shall be a horizontal discharge, 208/230 volt, single phase unit. The AM0**NXMDCR/AA outdoor system model numbers and the associated number of connectable indoor units per AM0**NXMDCR/AA outdoor unit is indicated in the following table. Each indoor unit or group of indoor units shall be independently controlled.

A. General:

1. The heat recovery outdoor unit shall be specifically used with SAMSUNG DVM S Heat recovery components. The SAMSUNG DVM S ECO HR system shall consist of AM0**NXMDCR/AA outdoor unit, HR Changer (MCU-R4NEK0N), additional MCU's (mode control units) if required, indoor units (AM****N**CH/AA), and SAMSUNG DVM S NASA Control Network Solution (Control systems). AM0**NXMDCR/AA outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

2. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor rated capacity.

3. The heat recovery system compressors shall be SAMSUNG, hermetically sealed, inverter driven, Twin BLDC Rotary type (AM0**NXMDCR/AA models) or flash injected, asymmetric scroll (AM060NXMDCR/AA only). No fixed capacity compressors shall be present in the refrigerant system.

4. All refrigerant lines from the outdoor unit shall be insulated.

5. The heat recovery outdoor unit shall have an accumulator

6. The heat recovery outdoor unit shall have a high-pressure safety switch, over-current protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heating, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

7. The heat recovery outdoor unit shall have the ability to operate with a maximum height difference of 164 feet with the condensing unit installed higher than the indoor units or 131 feet with the condensers installed lower than the indoor units. The greatest length is not to exceed 492 (574 equivalent) feet between outdoor unit and the farthest indoor unit.

8. The heat recovery outdoor unit shall be capable of operating in cooling mode between 0°F ~ 118°F (-18°C ~ 48°C) outdoor ambient temperatures. When outdoor temperature is between 0°F ~ 23°F (-18°C ~ -5°C), wind baffles are

required. When outdoor temperature is between 0°F ~ 23°F (-18°C ~ -5°C), 50% operating capacity should be maintained to ensure reliability while in cooling mode.

9. The heat recovery outdoor unit shall be capable of operating in heating mode between -13°F ~ 75°F (-25°C ~ 24°C) ambient temperatures.

10. The heat recovery system shall have installer enabled snow blowing settings to prevent snow accumulation in front of idle outdoor units during when below 42º F.

11. The heat recovery shall have the ability to adjust cooling and heating temperature/pressure compensation values depending on project conditions thus saving energy.

12. The heat recovery outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

13. The heat recovery outdoor unit shall have a flat plate type sub-cooler to sub cool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

14. The heat recovery system shall have optional night quite modes to reduce unit sound in evenings (automatic activation or manual activation using MIM-B14 external contact interface module).

15. The heat recovery system shall have current control to limit current adjustable at outdoor unit. Maximum current limitation shall allow setting of 50 ~ 100% current limitation from design current in 5% increments.

16. The heat recovery outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

17. The heat recovery outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

18. The heat recovery outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

19. In the event of system error due to outdoor unit failure, the heat recovery outdoor unit shall display codes that specify a precise cause of error.

20. The heat recovery outdoor unit shall have adjustable defrost operation characteristics adjustable at the outdoor PCB.

21. The heat recovery outdoor unit shall support the installation of an optional Samsung base pan heater kit (MCH-015EE). The optional base pan heater function shall be field enabled after installation of the kit.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. The heat recovery outdoor unit shall be furnished with 2 axial fans with BLDC motors.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have horizontal discharge airflow.

A. Refrigerant:

1. R410A refrigerant shall be required for the heat recovery system.

2. Additional refrigerant is required. Amount is based on installed refrigerant pipe diameters and lengths and connected indoor unit models.

D. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The coil shall be protected with an integral metal guard.

3. The Heat Recovery condensing unit salt spray test method: ASTM B117 - the heat exchanger showed no unusual rust or corrosion development to 2,280 hours.

E. Compressor:

1. Refrigerant flow from the AM036NXMDCR/AA, AM048NXMDCR/AA, and AM053NXMDCR/AA heat recovery units shall be controlled by means of a capacity modulation capable Twin BLDC Rotary compressor.

2. Refrigerant flow from the AM060NXMDCR/AA heat recovery unit shall be controlled by means of a capacity modulation capable scroll compressor with flash injection. Flash injection technology is used to increase performance in both heating and cooling modes. This will be automatically enabled by the outdoor unit by forcing saturated refrigerant flash directly into the scroll compression cycle increasing mass flow and overall system capacity.

3. The heat recovery outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

4. The compressors shall have crankcase heating capability.

5. The outdoor unit compressor shall have compressor controls that will allow modulation of capacity.

6. The compressor will be equipped with an internal thermal overload.

7. The compressor shall be mounted to avoid the transmission of vibration.

F. Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The 208/230 VAC unit shall be capable of satisfactory operation within voltage limitations of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The outdoor unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, 16 AWG, shielded, two-core cable to provide total integration of the system.

2.8 HR CHANGER (MODE CONTROL UNIT) FOR DVM S ECO 1Ø HEAT RECOVERY SYSTEMS (MCU-R4NEK0N)

A. General:

The HR CHANGER MCU (Mode Control Unit) shall be specifically used with R410A, AM0**NXMDCR/AA heat recovery outdoor units. These units shall be equipped with a circuit board that interfaces to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The HR Changer MCU (Mode Control Unit) shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. The unit shall be mounted indoors.

Indoor unit connection data is noted below.

MCU Model Number	***Connectable Indoor Unit Qty.***	***Port Qty.***	***Sum of Indoor Unit Capacity (maximum)***
MCU-R4NEK0N	1 - 12	4	Up to 76,000 Btu/h

1. MCU-R4NEK0N (HR Changer) shall have 4 ports with a maximum conn ected quantity of 12 indoor units (maximum 3 indoor units per port). Th e sum of indoor unit's capacity shall not exceed 19 MBH (19,000 btu/h) per port, and 76 MBH (76,000 btu/h) total. Two (2) adjacent ports shall be twinned using Y-Joint part number MXJ-YM1206R (purchased separat ely) when connecting indoor unit(s) greater than 19 MBH (19,000 btu/h), but less than 48 MBH (48,000 btu/h). The MCU-R4NEK0N shall not co nnect under-ceiling indoor units without the installation of single zone EE V kits (MEV-A**SA). MCU-R4NEK0N shall allow series connection of ad ditional MCU's reducing Y-joint installation to a maximum capacity of (76 MBH) 76,000 btu/h. The MCU-R4NEK0N is only compatible with AM***N XMDCR/AA (DVM S ECO), and must be installed on every system.

B. HR CHANGER MCU (Mode Control Unit) Cabinet:

1. The chassis shall be fabricated of galvanized steel.

2. Each cabinet shall house multiple refrigeration control solenoid valves and electronic expansion valves.

3. MCU-R4NEK0N shall house four tube-in-tube subcooling devices with electronic expansion valve and temperature sensors to maintain design refrigerant temperatures (sub cooling). All pipe connections shall be braze type

C. Refrigerant:

1. R410A refrigerant shall be required for MCU's (Mode Control Units).

D. Refrigerant valves:

1. The unit shall be furnished with multiple two position solenoid valves.

2. When connecting an indoor unit greater than 19,000 btu/h and less than or equal to 48,000 btu/h to MCU-R4NEK0N (HR Changer) or MCU-S4NEK3N, two adjacent branch circuits shall be joined together at the branch controller to deliver an appropriate amount of refrigerant. The two refrigerant valves shall operate simultaneously. The Y-joints necessary to connect 2 circuits or ports are sold separately.

3. Electronic expansion valves and solenoid valves shall be used to control the variable refrigerant flow inside each HR Changer MCU (Mode Control Units).

E. Integral Drain Pan:

1. MCU-6NEK3N shall include an integral condensate pan. Drain connection is not required

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, and 60 hertz.

2. The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).

3. The MCU (Mode Control Unit) shall be controlled by integral microprocessors.

4. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two conductor, 16 AWG, shielded cable to provide total integration of the system.

2.9 MCU (MODE CONTROL UNIT) FOR HEAT RECOVERY SYSTEMS

A. General:

The MCU (Mode Control Unit) shall be specifically used with R410A, AM****X***R/AA and AM****X***R2AA heat recovery outdoor units. These units shall be equipped with a circuit board that interfaces to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The MCU (Mode Control Unit) shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. The unit shall be mounted indoors. The sum of connected capacity of indoor units shall range from 7,000 – 216,000 btu/h capacity at one MCU depending on model. The AM****X***R/AA and AM****X***R2AA heat recovery outdoor units shall connect multiple MCUs, up to 16 total per system.

There shall be nine models of Mode Control Units: MCU-S4NEE1N, MCU-S6NEE1N, MCU-S4NEE2N, MCU-S2NEK1N, MCU-S1NEK1N, MCU-S2NEK2N, MCU-S4NEK3N, MCU-S6NEK2N, and MCU-S6NEK3N. The below table identifies MCU models and indoor unit connection data.

MCU Model Number	***Connectable Indoor Unit Qty.***	***Port Qty.***	***Sum of Indoor Unit Capacity (maximum)***
MCU-S1NEK1N	1 - 8	1	Up to 54,000 Btu/h
MCU-S2NEK2N	1 - 16	2	Up to 108,000 Btu/h
MCU-S4NEK3N	1 - 32	4	Up to 216,000 Btu/h
MCU-S6NEK2N	1 - 32	6	Up to 216,000 Btu/h
MCU-S6NEK3N	1 - 18	6	Up to 76,000 Btu/h

1. MCU-S1NEK1N shall have 1 port with a maximum connected quantity of 8 indoor units. The sum of indoor unit's capacity shall not exceed 54 MBH (54,000 btu/h). The MCU-S1NEK1N shall not connect under-ceilin g indoor units without the installation of single zone EEV kits (MEV-A**S A).

2. MCU-S2NEK2N shall have 2 ports with a maximum connected quantity of 16 indoor units (maximum 8 indoor units per port). The sum of indoor unit's capacity shall not exceed 54MBH (54,000 btu/h) per port, and 108 MBH (108,000 btu/h) total. Two (2) adjacent ports shall be twinned using Y-Joint part number MXJ-YA1509M (purchased separately) when connecting indoor unit(s) greater than 54 MBH (54,000 btu/h), but less than 108 MBH (108,000 btu/h). The MCU-S2NEK2N shall not connect under-ceiling indoor units without the installation of single zone EEV kits (MEV-A**SA). Ports shall be twinned using Y-Joint part number MXJ-YA1509M (purchased separately) when connecting indoor units greater than 54 MBH (54,000 btu/h), but less than 108 MBH (108,000 btu/h). MCU-S2NEK2N shall allow series connection of additional MCU's reducing Y-joint installation to a maximum capacity of (108 MBH) 108,000 btu/h.

3. MCU-S4NEK3N shall have 4 ports with a maximum connected quantity of 32 indoor units (maximum 8 indoor units per port). The sum of indoor unit's capacity shall not exceed 54MBH (54,000 btu/h) per port, and 216 MBH (216,000 btu/h) total. Two (2) adjacent ports shall be twinned using Y-Joint part number MXJ-YA1509M (purchased separately) when connecting indoor unit(s) greater than 54 MBH (54,000 btu/h), but less than 108 MBH (108,000 btu/h). The MCU-S4NEK3N shall not connect under-ceiling indoor units without the installation of single zone EEV kits (MEV-A**SA). MCU-S4NEK3N shall allow series connection of additional MCU's reducing Y-joint installation to a maximum capacity of (216 MBH) 216,000 btu/h.

4. MCU-S6NEK2N shall have 6 ports with a maximum connected quantity of 32 indoor units (maximum 8 indoor units per port). The sum of indoor unit's capacity shall not exceed 54MBH (54,000 btu/h) per port, and 216 MBH (216,000 btu/h) total. Two (2) adjacent ports shall be twinned using Y-Joint part number MXJ-YA1509M (purchased separately) when connecting indoor unit(s) greater than 54 MBH (54,000 btu/h), but less than 108 MBH (108,000 btu/h). The MCU-S6NEK2N shall not connect under-ceiling indoor units without the installation of single zone EEV kits (MEV-A**SA). MCU-S6NEK2N shall allow series connection of additional MCU's reducing Y-joint installation to a maximum capacity of (216 MBH) 216,000 btu/h.

5. MCU-S6NEK3N shall have 6 ports with a maximum connected quantity of 18 indoor units (maximum 3 indoor units per port). The sum of indoor unit's capacity shall not exceed 19 MBH (19,000 btu/h) per port, and

76 MBH (76,000 btu/h) total. Two (2) adjacent ports shall be twinned usi ng Y-Joint part number MXJ-YM1206M (purchased separately) when con necting indoor unit(s) greater than 19 MBH (19,000 btu/h), but less than 48 MBH (48,000 btu/h). The MCU-S6NEK3N shall not connect under-ce iling indoor units without the installation of single zone EEV kits (MEV-A* *SA). MCU-S6NEK3N shall allow series connection of additional MCU's reducing Y-joint installation to a maximum capacity of (76 MBH) 76,000 btu/h.

B. MCU (Mode Control Unit) Cabinet:

1. The chassis shall be fabricated of galvanized steel.

2. Each cabinet shall house multiple refrigeration control solenoid valves and electronic expansion valves.

3. MCU-S1NEK1N shall house one tube-in-tube subcooling device with electronic expansion valve and temperature sensors to maintain design refrigerant temperatures (sub cooling). All pipe connections shall be braze type.

4. MCU-S2NEK2N shall house two tube-in-tube subcooling devices with electronic expansion valve and temperature sensors to maintain design refrigerant temperatures (sub cooling). All pipe connections shall be braze type.

5. MCU-S4NEK3N shall house four tube-in-tube subcooling devices with electronic expansion valve and temperature sensors to maintain design refrigerant temperatures (sub cooling). All pipe connections shall be braze type.

6. MCU-R4NEK0N shall house four tube-in-tube subcooling devices with electronic expansion valve and temperature sensors to maintain design refrigerant temperatures (sub cooling). All pipe connections shall be braze type

7. MCU-S6NEK3N shall house six tube-in-tube subcooling devices with electronic expansion valve and temperature sensors to maintain design refrigerant temperatures (sub cooling). All pipe connections shall be braze type.

C. Refrigerant:

1. R410A refrigerant shall be required for MCU's (Mode Control Units).

D. Refrigerant valves:

1. The unit shall be furnished with multiple two position solenoid valves.

2. When connecting an indoor unit greater than 54,000 btu/h to MCU-S2NEK2N, MCU-S4NEK3N, and MCU-S6NEK2N, two adjacent branch circuits shall be joined together at the branch controller to deliver an appropriate amount of refrigerant. The two refrigerant valves shall operate simultaneously. The Y-joints necessary to connect 2 circuits or ports are sold separately.

3. When connecting an indoor unit greater than 19,000 btu/h but less than or equal to 48,000 btu/h to MCU-6NEK3N, two adjacent branch circuits shall be joined together at the branch controller to deliver an appropriate amount of refrigerant. The two refrigerant valves shall operate simultaneously. The Y-joints necessary to connect 2 circuits or ports are sold separately.

4. When connecting an indoor unit greater than 19,000 btu/h and less than or equal to 48,000 btu/h to MCU-R4NEK0N (HR Changer) or MCU-S4NEK3N, two adjacent branch circuits shall be joined together at the branch controller to deliver an appropriate amount of refrigerant. The two refrigerant valves shall operate simultaneously. The Y-joints necessary to connect 2 circuits or ports are sold separately.

5. Electronic expansion valves and solenoid valves shall be used to control the variable refrigerant flow inside each MCU (Mode Control Units).

E. Integral Drain Pan:

1. MCU-S1NEK1N, MCU-S2NEK2N, MCU-S4NEK3N, MCU-S6NEK2N, MCU-S6NEK3N, and MCU-6NEK3N shall include an integral condensate pan. Drain connection is not required

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, and 60 hertz.

2. The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).

3. The MCU (Mode Control Unit) shall be controlled by integral microprocessors.

4. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two conductor, 16 AWG, shielded cable to provide total integration of the system.

2.10 HEAT PUMP CONDENSING UNIT (208/230V, 3Ø)

A. General:

The heat pump outdoor unit shall be specifically used with SAMSUNG DVM S2 Heat pump components. The SAMSUNG DVM S2 HP outdoor unit shall consist of the AM***BXVGFH/AA outdoor unit, indoor units (AM****N****/AA), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor rated capacity. Connection up to 184% is possible under certain design conditions (refer to details in engineering manuals provided by the manufacturer).

2. The Heat Pump condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 3,000 hours.

3. The heat pump system compressors shall be SAMSUNG, asymmetric, hermetically sealed, inverter driven, flash injected, DC scroll type. No fixed capacity compressors shall be present in the refrigerant system.

4. The heat pump system shall have the ability to change operation mode without turning off the compressors allowing for constant heating and cooling operation

5. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode. While in heat mode, any defrost cycle lasting over three (3) minutes shall be considered an oil recovery cycle.

6. Advanced intelligent defrost logic to significantly reduce defrost cycle frequency by monitoring air resistance across the condenser coil during heating operation to determine defrost operation initiation to prevent unnecessary defrost cycles.

7. Outdoor unit (individual modules) shall have a sound rating no higher than 67 dB (A).

8. Both refrigerant lines from the outdoor unit shall be insulated.

9. The heat pump outdoor unit shall have an accumulator with ARV (accumulator return valve) control.

10. The heat pump outdoor unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heating, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

11. The inverter compressor PCB(s) shall be cooled with liquid refrigerant ci rcuit(s) and air-cooling fins to operate at optimal temperatures and to pr event failure due to overheating.

12. The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet between the outdoor unit and the lowest indoor unit when the condensing unit is installed higher than the indoor units (with modified piping and PDM kit when greater than 164 feet). The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet between the outdoor unit and the highest indoor unit when the condensing unit is installed lower than the indoor units (conditions apply when over 131). Maximum 3,280 feet total refrigerant tubing length. The greatest length is not to exceed 656 (722 equivalent) feet between outdoor unit and the farthest indoor unit.

13. Indoor units on Heat Pump system shall have a maximum vertical separation of 164 feet between the highest and lowest indoor units.

14. The heat pump outdoor unit shall be capable of operating in cooling mode between 23°F ~ 122°F (-5°C to 50°C) outside ambient temperatures.

15. The heat pump outdoor unit shall be capable of operating in cooling mode below 23°F (-5°C) down to 5°F (-15°C) outside ambient temperature with the addition of accessory low ambient cooling side guards (LACH).

16. The heat pump outdoor unit shall be capable of operating in cool mode down to -13°F (-25°C) ambient temperatures with use of low ambient cooling hood and side/rear guard accessories (LACH) to provide 100% cooling capacity.

17. The heat pump outdoor unit shall be capable of operating in heating mode between -22°F ~ 75°F (-30°C ~ 24°C) ambient temperatures.

18. The heat pump system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy.

19. The heat pump outdoor unit shall have a high efficiency, individual oil separators for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

20. The heat pump outdoor unit shall have a flat-plate type subcooler to sub cool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

21. The heat pump system shall have optional snow blowing settings to prevent snow accumulation on top of unit.

22. The heat pump system shall have optional night quite modes to reduce unit sound in evenings (4 levels).

23. The heat pump system shall have current control to limit current (50% - 100% of design current) adjustable at outdoor unit or web accessible, central control devices provided by the VRF manufacturer.

24. The heat pump outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

25. The heat pump outdoor unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the outdoor unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

26. The heat pump outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

27. The heat pump outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

28. The heat pump outdoor unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

29. The heat recovery outdoor unit shall have capability to reduce compressor Hz (heating capacity) further when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode, thus saving energy.

30. The heat recovery outdoor unit shall have capability to reduce compressor Hz (cooling capacity) when average indoor unit ((room temperature – set temperature) < 3.6º F) while operating in cooling mode, thus saving energy.

31. The heat pump outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

32. In the event of system error due to outdoor unit failure, the heat pump outdoor unit shall display codes that specify a precise error and which outdoor unit PCB is the cause.

33. The heat pump system shall support system auto-addressing allowing system commissioning without manually configuring indoor unit addresses.

34. The Heat Pump system (does not apply to Heat Recovery systems) shall feature a Cooling Priority option that will switch the heat pump to cooling mode if there is a demand for cooling from any indoor unit. Cooling Priority shall be

used on systems where indoor units have an external heat source (ex: electric heat). While the heat pump is in heating mode (all units in heat mode or off), the compressor shall operate in heating mode. When one or more indoor unit(s) demand cooling, the heat pump will stop heating operation and changeover to cooling mode. Indoor units that are in heating mode will no longer heat using the heat pump but with the connected external heat source. After all indoor units in cooling mode have satisfied, the outdoor unit will changeover to heating mode again (if a heating demand still exists). All indoor units must be in Auto mode for this function to work.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. All fan motors shall be variable speed BLDC type.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have vertical discharge airflow.

6. The heat pump outdoor units shall not require any field installed components or component modification to allow ducting of discharge air. Outdoor unit capacities 6 – 14 tons (nominal) shall have the capability for ducting of discharge air up to 0.43" WC static pressure with factory provided dimensional design drawings. Outdoor unit capacities 16 – 20 tons (nominal) shall have the capability for ducting of discharge air up to 0.32" WC static pressure with factory provided dimensional design drawings.

D. Refrigerant:

1. R410A refrigerant shall be required for the heat pump system.

2. Additional refrigerant is required. Amount is based on installed refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems shall require outdoor refrigerant kits for module connection provided by the manufacturer

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The Heat Pump condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 2,280 hours.

3. The coil shall be protected with an integral metal guard.

4. The heat exchanger shall consist of two separate circuits to enhance the heat pump defrost cycle. The unit shall use the entire coil initially for the defrost cycle. To resume heating faster in extreme conditions, the upper section shall return to heating operation while the lower section continues to defrost.

F. Compressor:

1. The compressors shall have flash injection capability to increase performance in heating mode. This will be automatically enabled by the outdoor unit(s) by forcing saturated refrigerant as a liquid flash mix directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without flash injection shall not be present in the VRF heat pump system.

2. All compressors shall be modulation capable, flash injected, DC inverter, scroll type.

3. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable flash injection scroll compressor.

4. Crankcase heaters shall be factory mounted on the compressors. For units without crankcase heaters, the compressors shall be warmed by the compressor inverter control PCB and motor windings.

5. The outdoor unit compressor shall have a variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

6. The outdoor unit compressor shall have flash injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing

temperatures resulting in a capacity and performance improvement in heating mode.

7. The compressor(s) will be equipped with an internal thermal overload.

8. The compressor(s) shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 3 phase, 60 hertz.

2. The 208/230 VAC unit shall be capable of satisfactory operation within voltage limitations of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The outdoor unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, 16 AWG, shielded, two-core cable to provide total integration of the system.

2.11 HEAT PUMP CONDENSING UNIT (460V, 3Ø)

A. General:

The heat pump outdoor unit shall be specifically used with SAMSUNG DVM S2 Heat pump components. The SAMSUNG DVM S HP outdoor unit shall consist of the AM***BXVGFH/AA outdoor unit, indoor units (AM****N****/AA) and SAMSUNG DVM S NASA Control Network Solution (Control systems). The outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor rated capacity. Connection up to 184% is possible under certain design conditions (refer to details in engineering manuals provided by the manufacturer).

2. The heat pump condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 3,000 hours.

3. The heat pump system compressors shall be SAMSUNG, asymmetric, hermetically sealed, inverter driven, flash injected, DC scroll type. No fixed capacity compressors shall be present in the refrigerant system.

4. The heat pump system shall have the ability to change operation mode without turning off the compressors allowing for constant heating and cooling operation

5. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode. While in heat mode, any defrost cycle lasting over three (3) minutes shall be considered an oil recovery cycle.

6. Advanced intelligent defrost logic to significantly reduce defrost cycle frequency by monitoring air resistance across the condenser coil during heating operation to determine defrost operation initiation to prevent unnecessary defrost cycles.

7. Outdoor unit (individual modules) shall have a sound rating no higher than 67 dB (A).

8. Both refrigerant lines from the outdoor unit shall be insulated.

9. The heat pump outdoor unit shall have an accumulator with ARV (accumulator return valve) control.

10. The heat pump outdoor unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heating, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

11. The inverter compressor PCB(s) shall be cooled with liquid refrigerant ci rcuit(s) and air-cooling fins to operate at optimal temperatures and to pr event failure due to overheating.

12. The heat pump outdoor unit shall have the ability to operate with a ma ximum height difference of 361 feet between the outdoor unit and the lo west indoor unit when the condensing unit is installed higher than the in door units (with modified piping and PDM kit when greater than 164 feet). The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet between the outdoor unit and the highest indoor unit when the condensing unit is installed lower than the indoor units (conditions apply when over 131). Maximum 3,280 feet tot

al refrigerant tubing length. The greatest length is not to exceed 656 (7 22 equivalent) feet between outdoor unit and the farthest indoor unit.

13. Indoor units on Heat Pump system shall have a maximum vertical separation of 164 feet between the highest and lowest indoor units.

14. The heat pump outdoor unit shall be capable of operating in cooling mode between 23°F ~ 122°F (-5°C to 50°C) outside ambient temperatures.

15. The heat pump outdoor unit shall be capable of operating in cooling mode below 23°F (-5°C) down to 5°F (-15°C) outside ambient temperature with the addition of accessory low ambient cooling side guards (LACH).

16. The heat pump outdoor unit shall be capable of operating in cool mode down to -13°F (-25°C) ambient temperatures with use of low ambient cooling hood and side/rear guard accessories (LACH) to provide 100% cooling capacity.

17. The heat pump outdoor unit shall be capable of operating in heating mode between -22°F ~ 75°F (-30°C ~ 24°C) ambient temperatures.

18. The heat pump system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy.

19. The heat pump outdoor unit shall have a high efficiency, individual oil separators for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

20. The heat pump outdoor unit shall have a flat-plate type subcooler to sub cool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

21. The heat pump system shall have optional snow blowing settings to prevent snow accumulation on top of unit.

22. The heat pump system shall have optional night quite modes to reduce unit sound in evenings (4 levels).

23. The heat pump system shall have current control to limit current (50% - 100% of design current) adjustable at outdoor unit or web accessible, central control devices provided by the VRF manufacturer.

24. The heat pump outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable

from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

25. The heat pump outdoor unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the outdoor unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

26. The heat pump outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

27. The heat pump outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

28. The heat pump outdoor unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

29. The heat recovery outdoor unit shall have capability to reduce compressor Hz (heating capacity) further when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode, thus saving energy.

30. The heat recovery outdoor unit shall have capability to reduce compressor Hz (cooling capacity) when average indoor unit ((room temperature – set temperature) < 3.6º F) while operating in cooling mode, thus saving energy.

31. The heat pump outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

32. In the event of system error due to outdoor unit failure, the heat pump outdoor unit shall display codes that specify a precise error and which outdoor unit PCB is the cause.

33. The heat pump system shall support system auto-addressing allowing system commissioning without manually configuring indoor unit addresses.

34. The Heat Pump system (does not apply to Heat Recovery systems) shall feature a Cooling Priority option that will switch the heat pump to cooling mode if there is a demand for cooling from any indoor unit. Cooling Priority shall be used on systems where indoor units have an external heat source (ex: electric heat). While the heat pump is in heating mode (all units in heat mode or off), the compressor shall operate in heating mode. When one or more indoor unit(s) demand cooling, the heat pump will stop heating operation and changeover to cooling mode. Indoor units that are in heating mode will no longer heat using the heat pump but with the connected external heat source. After all indoor units in cooling mode have satisfied, the outdoor unit will changeover to heating mode again (if a heating demand still exists). All indoor units must be in Auto mode for this function to work.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. All fan motors shall be variable speed BLDC type.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have vertical discharge airflow.

6. The heat pump outdoor units shall not require any field installed components or component modification to allow ducting of discharge air. Outdoor unit capacities 6 – 14 tons (nominal) shall have the capability for ducting of discharge air up to 0.43" WC static pressure with factory provided dimensional design drawings. Outdoor unit capacities 16 – 20 tons (nominal) shall have

the capability for ducting of discharge air up to 0.32" WC static pressure with factory provided dimensional design drawings.

D. Refrigerant:

1. R410A refrigerant shall be required for the heat pump system.

2. Additional refrigerant is required. Amount is based on installed refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems shall require outdoor refrigerant kits for module connection provided by the manufacturer

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The Heat Pump condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 2,280 hours.

3. The coil shall be protected with an integral metal guard.

4. The heat exchanger shall consist of two separate circuits to enhance the heat pump defrost cycle. The unit shall use the entire coil initially for the defrost cycle. To resume heating faster in extreme conditions, the upper section shall return to heating operation while the lower section continues to defrost.

F. Compressor:

1. The compressors shall have flash injection capability to increase performance in heating mode. This will be automatically enabled by the outdoor unit(s) by forcing saturated refrigerant as a liquid flash mix directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without flash injection shall not be present in the VRF heat pump system.

2. All compressors shall be modulation capable, flash injected, DC inverter, scroll type.

3. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable flash injection scroll compressor.

4. Crankcase heaters shall be factory mounted on the compressors. For units without crankcase heaters, the compressors shall be warmed by the compressor inverter control PCB and motor windings.

5. The outdoor unit compressor shall have a variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

6. The outdoor unit compressor shall have flash injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing temperatures resulting in a capacity and performance improvement in heating mode.

7. The compressor(s) will be equipped with an internal thermal overload.

8. The compressor(s) shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 460 Volts, 3 phase, 60 hertz.

2. The outdoor unit shall be controlled by integral microprocessors.

3. The control circuit between the indoor units and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, 16 AWG, shielded, two-core cable to provide total integration of the system.

2.12 LOW AMBIENT HEATING (MAX HEAT), HEAT PUMP CONDENSING UNIT (208/230V, 3Ø)

A. General:

The heat pump outdoor unit shall be used specifically with SAMSUNG DVM S Heat Pump components. The heat recovery outdoor unit shall consist of the AM***KXVTFH/AA outdoor unit, indoor units (AM****N**CH**/AA models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The AM***KXVTFH/AA outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The low ambient heating heat pump outdoor shall perform as noted belo

w at -13°F outside ambient temperature.

Capacity at -13°F OA (70°F DB indoor)		
System Model Number	***Design Diversity (Capacity Ratio)***	
	100%	***130%***
AM072KXVTFH/AA	81,000	93,200
AM096KXVTFH/AA	108,000	124,300
AM144KXVTFH/AA	162,000	186,400
AM168KXVTFH/AA	189,000	217,500
AM192KXVTFH/AA	216,000	248,600
AM216KXVTFH/AA	243,000	279,600
AM240KXVTFH/AA	270,000	310,700
AM264KXVTFH/AA	297,000	341,800
AM288KXVTFH/AA	324,000	372,900

2. The heat pump system shall have the ability of simultaneous heating and cooling operation modes on all indoor units.

3. The Heat pump condensing unit salt spray test method: ASTM B117-18 –

   the heat exchanger showed no unusual rust or corrosion development to 2280hours.

4. The heat pump system shall have rotational defrost capability (modular systems only) to perform defrost operations while still providing heat to indoor units (operation and conditions restrictions exist).

5. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode. While in heat mode, any defrost cycle lasting over three (3) minutes shall be considered an oil recovery cycle.

6. Advanced intelligent defrost logic to significantly reduce defrost cycle frequency by monitoring air resistance across the condenser coil during heating operation to determine defrost operation initiation to prevent unnecessary defrost cycles (applies to models manufactured after 2014).

7. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity.

8. The heat pump system shall have installer enabled snow blowing settings to prevent snow accumulation on top of unit.

9. The heat pump system shall have optional night quite modes to reduce unit sound in evenings reducing fan and/or compressor sound (4 level settings).

10. The heat pump system shall have current control to limit current (50% - 100% of design current) adjustable at outdoor unit or web accessible, central control devices provided by the VRF manufacturer.

11. The heat pump system compressors shall be SAMSUNG, hermetically sealed, inverter driven, direct flash injected, asymmetric, DC scroll type. No fixed capacity compressors will be present in the refrigerant system.

12. Outdoor unit (individual modules) shall have a sound rating no higher than 64 dB (A).

13. Both refrigerant lines from the outdoor unit shall be insulated.

14. The heat pump system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy

15. The heat pump outdoor unit shall have an accumulator with ARV (accumulator return valve) control.

16. The heat pump outdoor unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heaters, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

17. The inverter compressor PCB(s) shall be cooled with liquid refrigerant circuit(s) to operate at optimal temperatures and to prevent failure due to overheating. No compressor inverter PCBs shall be cooled by air over heat sink exclusively. Cooling inverter components without air-cooling fins prevents failure due to environmental contaminants.

18. The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet with the condensing unit installed higher than the indoor units (with modified piping and PDM kit when greater than 164 feet). The heat pump outdoor unit shall have the ability to operate with a maximum

height difference of 361 feet with the condensing unit installed lower than the indoor units (conditions apply when over 131). Maximum 3,280 feet total refrigerant tubing length. The greatest length is not to exceed 656 (722 equivalent) feet between outdoor unit and the farthest indoor unit.

19. Indoor units on heat pump systems shall have a maximum vertical separation of 131 feet.

20. The heat pump outdoor unit shall be capable of operating in heat mode between -13°F ~ 75°F (-25°C ~ 24°C) ambient temperatures.

21. The heat pump outdoor unit shall be able to provide 100% heating capacity at -13°F (-25°C) outside ambient temperatures (no degradation of capacity down to -13°F (-25°C) due to outside ambient temperature).

22. The heat pump outdoor unit shall be capable of operating in cool mode between 23°F to 120°F (-5°C to 49°C) ambient temperatures as standard. Cool mode operation between 5°F ~ 120°F (-15°C ~ 49°C) is possible with a modified pipe design.

23. The heat pump outdoor unit shall be capable of operating in cooling mode below 23°F (-5°C) down to 5°F (-15°C) outside ambient temperature with the addition of accessory low ambient cooling side guards (LACH).

24. The heat pump outdoor unit shall have high efficiency, individual oil separator(s) for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

25. The heat pump outdoor unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

26. The heat pump outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

27. The heat pump outdoor unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the outdoor unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

28. The heat pump outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

29. The heat pump outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

30. The heat pump outdoor unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

31. The heat pump outdoor unit shall have capability to reduce compressor Hz (heating capacity) further when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode, thus saving energy.

32. The heat pump outdoor unit shall have capability to reduce compressor Hz (cooling capacity) when average indoor unit ((room temperature – set temperature) < 3.6º F) while operating in cooling mode, thus saving energy.

33. The heat pump outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

34. In the event of system error due to outdoor unit failure, the heat recovery outdoor unit shall display codes that specify a precise error and which outdoor unit PCB is the cause (main PCB, HUB PCB, IPM 1, IPM 2, fan PCB).

35. The heat pump system shall support system auto-addressing allowing system commissioning without manually configuring indoor unit addresses.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished

with a powder coated baked enamel.

C. Fan:

1. All fan motors shall be variable speed BLDC type.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The heat pump outdoor unit shall have vertical discharge airflow.

The heat pump outdoor units shall have the capability for ducting of dischar ge air up to 0.32" WC static pressure with factory provided dimensional des ign drawings. The heat recovery outdoor units shall not require any field in stalled components or component modification to allow ducting of discharge air.

D. Refrigerant:

1. R410A refrigerant shall be required for the heat recovery outdoor systems.

2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems shall require outdoor refrigerant kits for module connection provided by the manufacturer.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The heat pump condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 2280 hours.

3. The coil shall be protected with an integral metal guard.

F. Compressor:

1. The compressors shall have flash injection capability to increase performance in both heating and cooling modes. This will be automatically enabled by the outdoor unit(s) by forcing saturated refrigerant flash directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without flash injection shall not be present in the VRF heat recovery system.

2. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable, flash injected, DC inverter, scroll compressor.

1. All compressors shall be modulation capable, direct flash injected, DC inverter, scroll type.

2. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable flash injection scroll compressor.

3. Crankcase heaters shall be factory mounted on the compressors.

4. The outdoor unit compressor shall have variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

5. The outdoor unit compressor(s) shall have flash injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing temperatures resulting in a capacity and performance improvement in heating and cooling modes. Compressors without flash injection shall not be present in the VRF heat recovery system.

6. The compressor(s) will be equipped with an internal thermal overload.

7. The compressor(s) shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 3 phase, 60 hertz.

2. The 208/230 VAC outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).

3. The outdoor unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system (F1/F2).

2.13 LOW AMBIENT HEATING (MAX HEAT), HEAT PUMP CONDENSING UNIT (460V, 3Ø)

A. General:

The heat pump outdoor unit shall be used specifically with SAMSUNG DVM S Heat Pump components. The heat recovery outdoor unit shall consist of the AM***KXVTJH/AA outdoor unit, indoor units (AM****N**CH**/AA models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The AM***KXVTFH/AA outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The low ambient heating heat pump outdoor shall perform as noted belo w at -13°F outside ambient temperature.

Capacity at -13°F OA (70°F DB indoor)		
System Model Number	Design Diversity (Capacity Ratio)	
	100%	130%
AM072KXVTJH/AA	81,000	93,200
AM096KXVTJH/AA	108,000	124,300
AM144KXVTJH/AA	162,000	186,400
AM168KXVTJH/AA	189,000	217,500
AM192KXVTJH/AA	216,000	248,600
AM216KXVTJH/AA	243,000	279,600
AM240KXVTJH/AA	270,000	310,700
AM264KXVTJH/AA	297,000	341,800
AM288KXVTJH/AA	324,000	372,900

2. The heat pump system shall have the ability of simultaneous heating and cooling operation modes on all indoor units.

3. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 –

   the heat exchanger showed no unusual rust or corrosion development to 2280hours.

4. The heat pump system shall have rotational defrost capability (modular systems only) to perform defrost operations while still providing heat to indoor units (operation and conditions restrictions exist).

5. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode. While in heat mode, any defrost cycle lasting over three (3) minutes shall be considered an oil recovery cycle.

6. Advanced intelligent defrost logic to significantly reduce defrost cycle frequency by monitoring air resistance across the condenser coil during heating operation to determine defrost operation initiation to prevent unnecessary defrost cycles (applies to models manufactured after 2014).

7. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity.

8. The heat pump system shall have installer enabled snow blowing settings to prevent snow accumulation on top of unit.

9. The heat pump system shall have optional night quite modes to reduce unit sound in evenings reducing fan and/or compressor sound (4 level settings).

10. The heat pump system shall have current control to limit current (50% - 100% of design current) adjustable at outdoor unit or web accessible, central control devices provided by the VRF manufacturer.

11. The heat pump system compressors shall be SAMSUNG, hermetically sealed, inverter driven, direct flash injected, asymmetric, DC scroll type. No fixed capacity compressors will be present in the refrigerant system.

12. Outdoor unit (individual modules) shall have a sound rating no higher than 64 dB (A).

13. Both refrigerant lines from the outdoor unit shall be insulated.

14. The heat pump system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy

15. The heat pump outdoor unit shall have an accumulator with ARV (accumulator return valve) control.

16. The heat pump outdoor unit shall have a high pressure safety switch, high voltage fuses, over-current protection, phase detection protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heaters, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

17. The inverter compressor PCB(s) shall be cooled with liquid refrigerant circuit(s) to operate at optimal temperatures and to prevent failure due to overheating. No compressor inverter PCBs shall be cooled by air over heat sink exclusively. Cooling inverter components without air-cooling fins prevents failure due to environmental contaminants.

18. The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet with the condensing unit installed higher than the indoor units (with modified piping and PDM kit when greater than 164 feet). The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 361 feet with the condensing unit installed lower than the indoor units (conditions apply when over 131). Maximum 3,280 feet total refrigerant tubing length. The greatest length is not to exceed 656 (722 equivalent) feet between outdoor unit and the farthest indoor unit.

19. Indoor units on heat pump systems shall have a maximum vertical separation of 131 feet.

20. The heat pump outdoor unit shall be capable of operating in heat mode between -13°F ~ 75°F (-25°C ~ 24°C) ambient temperatures.

21. The heat pump outdoor unit shall be able to provide 100% heating capacity at -13°F (-25°C) outside ambient temperatures (no degradation of capacity down to -13°F (-25°C) due to outside ambient temperature).

22. The heat pump outdoor unit shall be capable of operating in cool mode between 23°F to 120°F (-5°C to 49°C) ambient temperatures as standard. Cool mode operation between 5°F ~ 120°F (-15°C ~ 49°C) is possible with a modified pipe design.

23. The heat pump outdoor unit shall be capable of operating in cooling mode below 23°F (-5°C) down to 5°F (-15°C) outside ambient temperature with the addition of accessory low ambient cooling side guards (LACH).

24. The heat pump outdoor unit shall have high efficiency, individual oil separator(s) for each compressor plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

25. The heat pump outdoor unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

26. The heat pump outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

27. The heat pump outdoor unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the outdoor unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

28. The heat pump outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

29. The heat pump outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

30. The heat pump outdoor unit shall allow temporary disabling of individual compressors to allow system operation at reduced capacity after a compressor or compressor component related issue (when more than one compressor is present in system). Disabling of a compressor shall temporarily remove error codes and allow system operation.

31. The heat pump outdoor unit shall have capability to reduce compressor Hz (heating capacity) further when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode, thus saving energy.

32. The heat pump outdoor unit shall have capability to reduce compressor Hz (cooling capacity) when average indoor unit ((room temperature – set temperature) < 3.6º F) while operating in cooling mode, thus saving energy.

33. The heat pump outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

34. In the event of system error due to outdoor unit failure, the heat recovery outdoor unit shall display codes that specify a precise error and which outdoor unit PCB is the cause (main PCB, HUB PCB, IPM 1, IPM 2, fan PCB).

35. The heat pump system shall support system auto-addressing allowing system commissioning without manually configuring indoor unit addresses.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. All fan motors shall be variable speed BLDC type.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The heat pump outdoor unit shall have vertical discharge airflow.

The heat pump outdoor units shall have the capability for ducting of dischar ge air up to 0.32" WC static pressure with factory provided dimensional des ign drawings. The heat recovery outdoor units shall not require any field in stalled components or component modification to allow ducting of discharge air.

D. Refrigerant:

1. R410A refrigerant shall be required for the heat recovery outdoor systems.

2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

3. Modular systems shall require outdoor refrigerant kits for module connection provided by the manufacturer.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The Heat Recovery condensing unit salt spray test method: ASTM B117-18 - the heat exchanger showed no unusual rust or corrosion development to 2280 hours.

3. The coil shall be protected with an integral metal guard.

F. Compressor:

1. The compressors shall have flash injection capability to increase performance in both heating and cooling modes. This will be automatically enabled by the outdoor unit(s) by forcing saturated refrigerant flash directly into the scroll compression cycle increasing mass flow and overall system capacity. Compressors without flash injection shall not be present in the VRF heat recovery system.

2. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable, flash injected, DC inverter, scroll compressor.

3. All compressors shall be modulation capable, direct flash injected, DC inverter, scroll type.

4. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable flash injection scroll compressor.

5. Crankcase heaters shall be factory mounted on the compressors.

6. The outdoor unit compressor shall have variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

7. The outdoor unit compressor(s) shall have flash injection technology which can increase the mass flow rate of refrigerant and offset refrigerant condensing temperatures resulting in a capacity and performance improvement in heating and cooling modes. Compressors without flash injection shall not be present in the VRF heat recovery system.

8. The compressor(s) will be equipped with an internal thermal overload.

9. The compressor(s) shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 460 Volts, 3 phase, 60 hertz.

2. The outdoor unit shall be controlled by integral microprocessors.

3. The control circuit between the indoor units and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system (F1/F2).

2.14 HEAT PUMP WATER-SOURCE CONDENSING UNIT (208/230V, 1Ø)

A. General:

The heat pump water-source unit shall be used specifically with SAMSUNG DVM S Heat Pump components. The heat pump water-source unit shall consist of the AM***KXWDCH/AA water-source unit, indoor units (AM****N**CH** models), and SAMSUNG DVM S NASA Control Network Solution (Control systems). The AM***KXWDCH/AA water-source units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The water-source unit shall have a powder coated finish. The water-source unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

1. The heat pump condensing unit shall perform as indicated below.

2. The outdoor unit shall have advanced oil recovery cycle logic operation that shall not interrupt heating or cooling operation. The oil recovery cycle duration shall not exceed three (3) minutes while in cooling mode or six (6) minutes while in heating mode.

3. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor nominal capacity.

4. The heat pump system shall have current control to limit current (50% - 100% of design current) adjustable at water-source unit or central web accessible, control devices: MIM-D00AN, MIM-D01AUN, MIM-B17N, MIM-B17BUN, MIM-B18N, or MIM-B18BUN.

5. The heat pump system compressors shall be SAMSUNG, hermetically sealed, inverter driven, Twin BLDC Rotary type. No fixed capacity compressors shall be present in the refrigerant system.

6. The water-source unit shall have a sound rating no higher than 49 dB (A).

7. Both lines from the water-source unit shall be insulated.

8. The heat pump system shall allow adjustment of target evaporator coil temperatures in cooling mode and target heating discharge pressures depending on project conditions for heating and cooling calibration thus saving energy.

9. The heat pump water-source unit shall have an accumulator.

10. The heat pump outdoor unit shall have a high pressure safety switch, over-current protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heaters, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

11. The heat pump water-source unit shall have the ability to operate with a maximum height difference of 98 feet with the water-source unit installed higher than the indoor units or 131 feet with the condensers installed lower than the indoor units and have total refrigerant tubing length of 656 feet. The greatest length is not to exceed 246 (295 equivalent) feet between water-source unit and the farthest indoor unit.

12. The heat pump water-source unit shall be capable of operating in ambient temperatures between 32°F ~ 104°F (0°C ~ 40°C).

13. The heat pump water-source unit shall be installed in a dry location.

14. The heat pump water-source unit shall have a flat-plate type subcooler to subcool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

15. The heat pump water-source unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the water-source unit EEPROM shall

be viewable from the manufacturer provided service software. The water-source unit main EEPROM shall be removable allowing replacement of water-source unit PCB without losing digital, field programmed data. The water-source unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

16. The heat pump water-source unit shall have the ability to discharge inverter PCB capacitor voltage using service buttons on the water-source unit main PCB. The capacitor stored-voltage discharge feature shall allow safe inverter PCB replacement.

17. The heat pump water-source unit shall have water-source unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of water-source unit chassis while performing service.

18. The heat pump water-source unit shall have capability to reduce heating capacity when average indoor unit ((set temperature – room temperature) < 3.6º F) while operating in heating mode.

19. The heat pump water-source unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

20. In the event of system error due to water-source unit failure, the heat pump water-source unit shall display codes that specify a precise error and which water-source unit PCB is the cause (main PCB, HUB PCB, IPM PCB).

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Refrigerant

1. R410A refrigerant shall be required for the pump water-source unit.

2. Additional refrigerant is required. Amount is based on installed liquid refrigerant pipe diameters and lengths and indoor equipment model number and quantity.

D. Heat Exchanger:

1. The water-source unit heat exchanger shall be a stainless steel brazed plate heat exchanger.

2. Refrigerant flow from the water-source unit shall be controlled by means of capacity modulation capable, vapor injected, DC inverter, scroll compressor (SAMSUNG).

E. Compressor:

1. The heat pump/heat recovery system shall have the compressor quantity noted in the table below. All compressors shall be modulation capable, DC inverter, Twin BLDC Rotary type.

2. Crankcase heaters shall be factory mounted on the compressors.

3. The water-source unit compressor shall have variable modulation technology to modulate capacity. System capacity shall be completely variable down to 7,513 Btu/h.

4. The compressor(s) will be equipped with an internal thermal overload.

5. The compressor(s) shall be mounted to avoid the transmission of vibration.

F. Water System:

1. The circulating water must meet the VRF manufacturer's specification and recommendations.

2. The water pipe system shall be closed loop. If hydrothermal or open cooling towers are used, additional heat exchangers must be installed in order to keep condenser water supply isolated from brazed plate heat exchanger (BPHX).

3. The water-source unit shall have a dry contact to enable/disable a 2-way solenoid valve. A high voltage output shall also be available from the water-source unit (0.2A, 250V max) to operate a 2-way solenoid valve.

4. The water-source unit shall have a 0V – 10V output to operate a flow control valve.

5. The water-source unit shall have a dry contact available to operate external water pumps.

6. The water system shall have a maximum working pressure of 285 PSI.

7. Water system inlet temperatures shall be within the temperatures noted below.

Type	***Circulating Water***	***Operation***	***Inlet Water Temperature*** [1]	
			Standard Usage Range	***Usage Range Limit***
Heat Source Water	Water Loop	Cooling	68°F ~ 95°F (20°C ~ 35°C)	50°F ~ 113°F (10°C ~ 45°C)
		Heating		
Ground Heat Source	Ground Loop	Cooling	59°F ~ 95°F (13°C ~ 35°C)	50°F ~ 113°F (10°C ~ 45°C)
		Heating	41°F ~ 77°F (5°C ~ 25°C)	23°F ~ 113°F (-5°C ~ 45°C) 14°F ~ 113°F[2] (-10°C ~ 45°C[2])

[1] When inlet water temperature is below 50°F (10°C), appropriate anti-freeze protection must be used according the manufacturer's guidelines.

[2] Strict management of anti-freezing concentration level is required. Consult the VRF manufacturer before application.

G. Electrical:

1. The water-source unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The 208/230 VAC water-source unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).

3. The water-source unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units and the water-source unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system (F1/F2).

2.15 DVM S ECO HEAT PUMP CONDENSING UNIT (208/230V, 1Ø)

A. General:

1. The heat pump outdoor unit shall be specifically used with SAMSUNG DVM S Heat pump components. The SAMSUNG DVM S ECO HP outdoor unit shall consist of AM0**M(T)XMDCH/AA outdoor unit, indoor units (AM****N**CH/AA), and SAMSUNG DVM S NASA Control Network Solution (Control systems).

AM0**M(T)XMDCH/AA outdoor units shall be equipped with multiple circuit boards that interface to the SAMSUNG DVM S NASA Control Network Solution (Control systems) and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

2. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor rated capacity.

3. The heat pump system compressors shall be SAMSUNG, hermetically sealed, inverter driven, Twin BLDC Rotary type (AM0**TXMDCH/AA models) or flash injected, asymmetric scroll (AM060MXMDCH/AA only). No fixed capacity compressors shall be present in the refrigerant system.

4. Both refrigerant lines from the outdoor unit shall be insulated.

5. The heat pump outdoor unit shall have an accumulator

6. The heat pump outdoor unit shall have a high-pressure safety switch, over-current protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heating, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.

7. The heat pump outdoor unit shall have the ability to operate with a maximum height difference of 163 feet with the condensing unit installed higher than the indoor units or 131 feet with the condensers installed lower than the indoor units. The greatest length is not to exceed 492 (574 equivalent) feet between outdoor unit and the farthest indoor unit.

8. The heat pump outdoor unit shall be capable of operating in cooling mode between 0°F ~ 120°F (-18°C ~ 49°C) outdoor ambient temperatures. When outdoor temperature is between 0°F ~ 23°F (-18°C ~ -5°C), wind baffles are required. When outdoor temperature is between 0°F ~ 23°F (-18°C ~ -5°C), 50% operating capacity should be maintained to ensure reliability while in cooling mode.

9. The heat pump outdoor unit shall be capable of operating in heating between -13°F ~ 75°F (-25°C ~ 24°C) ambient temperatures.

10. The heat pump system shall have installer enabled snow blowing settings to prevent snow accumulation in front of idle outdoor units during when below 42º F (6°C).

11. The heat pump shall have the ability to adjust cooling and heating temperature/pressure compensation values depending on project conditions thus saving energy.

12. The heat pump outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

13. The heat pump outdoor unit shall have a flat plate type sub-cooler to sub cool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.

14. The heat pump system shall have optional night quite modes to reduce unit sound in evenings (automatic activation or manual activation using MIM-B14 external contact interface module).

15. The heat pump system shall have current control to limit current adjustable at outdoor unit. Maximum current limitation shall allow setting of 50 ~ 100% current limitation from design current in 5% increments.

16. The heat pump outdoor unit shall have a removable EEPROM at the main PCB to store all unit data. All data on the outdoor unit EEPROM shall be viewable from the manufacturer provided service software. The outdoor unit main EEPROM shall be removable allowing replacement of outdoor unit PCB without losing digital, field programmed data. The outdoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit main PCB firmware and MICOM version, sub-PCB firmware and MICOM version, fan PCB firmware and MICOM version, inverter PCB 1 and inverter PCB 2 firmware and MICOM version, auto-trial commissioning startup data, the last 30 minutes of operation data, and field programmed unit name/tag viewable on controls and service software.

17. The heat pump outdoor unit shall have outdoor unit pump-down operation capability allowing storage of refrigerant while opening sealed refrigerant pipe system outside of outdoor unit chassis while performing service. The outdoor unit refrigerant storage shall be greater than the supplied factory R-410A charge.

18. The heat pump outdoor unit shall have individual outdoor module pump-out operation capability allowing the majority of refrigerant in an outdoor unit to be pumped out. The pump-out feature shall allow service of sealed refrigerant system within an outdoor unit chassis.

19. In the event of system error due to outdoor unit failure, the heat pump outdoor unit shall display codes that specify a precise cause of error.

20. The heat pump outdoor unit shall have adjustable defrost operation characteristics adjustable at the outdoor PCB.

B. Unit Cabinet:

1. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. The heat pump outdoor unit shall be furnished with 2 axial fans with BLDC motors.

2. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have horizontal discharge airflow.

D. Refrigerant:

1. R410A refrigerant shall be required for the heat pump system.

2. Additional refrigerant is required. Amount is based on installed refrigerant pipe diameters and lengths and connected indoor unit models.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The coil shall be protected with an integral metal guard.

3. The Heat Pump condensing unit salt spray test method: ASTM B117 - the heat exchanger showed no unusual rust or corrosion development to 2,280 hours.

F. Compressor:

1. Refrigerant flow from the AM036TXMDCH/AA, AM048TXMDCH/AA, and AM053TXMDCH/AA heat pump units shall be controlled by means of a capacity modulation capable Twin BLDC Rotary compressor.

2. Refrigerant flow from the AM060MXMDCH/AA heat pump unit shall be controlled by means of a capacity modulation capable scroll compressor with flash injection. Flash injection technology is used to increase performance in both heating and cooling modes. This will be automatically enabled by the outdoor unit by forcing saturated refrigerant flash directly into the scroll compression cycle increasing mass flow and overall system capacity.

3. The heat pump outdoor unit compressors shall have a soft-start function to reduce electricity demand during system start and to increase compressor reliability.

4. The compressors shall have crankcase heating capability.

5. The outdoor unit compressor shall have compressor controls that will allow modulation of capacity.

6. The compressor will be equipped with an internal thermal overload.

7. The compressor shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The 208/230 VAC unit shall be capable of satisfactory operation within voltage limitations of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The outdoor unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, 16 AWG, shielded, two-core cable to provide total integration of the system.

3. OUTDOOR UNIT ACCESSORIES

3.1 WIND/HAIL GUARD ACCESSORY FOR 3Ø UNITS (WHG-**)

A. General

1. Wind/hail guards shall be available for installation on the outdoor units.

2. Wind/Hail Guards are available for the top (hood), right, left, rear, and front sides of the outdoor unit.

3. Refer to manufacturer documentation for compatible wind/hail guard accessory model numbers and compatibility.

3.2 FRONT WIND BAFFLES FOR 1Ø CONDENSING UNITS (WBF-***)

A. General

1. Designed to be placed on fan discharge side (front).

2. Only a front shield is required for applications where the outdoor unit is adjacent to a structure that would protect the intake side from prevailing wind. Applications without this protection would require a back shield (ex : roof top).

3. The wind baffle material shall be powder coated, galvanized steel.

4. Refer to manufacturer documentation for compatible wind/hail guard accessory model numbers and compatibility.

3.3 BACK WIND BAFFLES FOR 1Ø CONDENSING UNITS (WBB-***)

A. General

1. Designed to be placed on the coil intake side of the unit (back).

2. Note: This back shield is only required for applications where the outdoo r unit is not adjacent to a structure that would protect the intake side fr om prevailing wind (ex: roof top).

3. The wind baffle material shall be powder coated, galvanized steel.

4. Refer to manufacturer documentation for compatible wind/hail guard acce ssory model numbers and compatibility.

3.4 HAIL GUARD KITS FOR 1Ø CONDENSING UNITS (HGK-*)

A. General

1. The outdoor unit(s) shall have hail guards provided by the HVAC manufa cturer.

2. The hail guard kit shall include a rear guard and a side guard designed to protect the condenser coil while providing sufficient airflow for optimal unit performance.

3. The wind baffle material shall be powder coated, galvanized steel.

3.5 BASE PAN HEATER FOR 3Ø AIR-COOLED CONDENSING UNITS

A. General

1. The optional Base Pan Heater Kit shall be compatible with Heat Pump a nd Heat Recovery models.

2. Base pan heater used to prevent ice formation in the bottom of the outd oor units and to promote water drainage after defrost cycles in extreme low ambient temperatures.

3. Application of base pan heaters is recommended when:

(a) The outdoor unit will operate in low temperature, high humidity condi tions for periods 72 hours or longer.

(b) When outside temperatures will drop below freezing for 24 hours.

4. The base pan heater shall activate when:

(a) Outdoor temperature is below 30°F (-1°C)

(b) The outdoor unit is in heating mode

(c) When an outdoor unit has been idle for 30 minutes and outside tem perature is 41°F (5°C) or lower the base pan heater will turn on ever y 30 minutes and for 5 minutes and the fan will operate for 1 minute (if snow accumulation prevention is enabled).

B. Required components

1. Each outdoor unit will require a base pan heater and a control box.

2. Refer to manufacturer documentation for compatible wind/hail guard acce ssory model numbers and compatibility.

3.6 BASE PAN HEATER FOR 1Ø AIR-COOLED CONDENSING UNITS

A. General

1. The optional Base Pan Heater Kit MHC-0015EE shall be compatible with DVM S Eco Heat Recovery models AM0**NXMDCR/AA and DV M S Eco Heat Pump models (AM0**TXMDCH/AA). Refer to manufac turer documentation for compatible wind/hail guard accessory model n umbers and compatibility.

2. Base pan heater used to prevent ice formation in the bottom of DVM S Eco outdoor units and to promote water drainage after defrost cyc les in extreme low ambient temperatures.

3. The optional base pan heater shall be field enabled via the outdoor unit option setting feature. The base pan heater shall activate during the following conditions:

    a. In Main Heating or Heating modes when outdoor temperature i s less than or equal to 30°F

    b. During snow accumulation prevention mode (field enabled settin g).

3.7 LOW AMBIENT COOLING HOOD ACCESSORY (LACH)

A. General

1. Low ambient cooling guards shall be available for installation on 3Ø outdoor units. A left, right, rear, front (applicable models only), and a top LACH hood are required.

2. Low ambient cooling accessories are available to allow the system to provide 100% cooling operation down to -13°F (-25°C) for both heat pump and heat recovery systems.

3. The low ambient cooling hood control PCB shall provide advanced logic control to fine tune louver position based on outdoor unit high pressure,

outdoor ambient temperature, outdoor unit compressor compression ratio, mode, and other outdoor unit points.

4. The Low Ambient Cooling Hood shall be powered via outdoor unit with provided wire and plug.

4. INDOOR UNITS AND ACCESSORIES

4.1 WINDFREE™ 4-WAY CEILING CASSETTE INDOOR UNIT WITH GRILLE (AM0**BN4PCH/AA, AM0**RN4DCH/AA)

A. General:

The WindFree™ 4-way cassette shall be style indoor unit shall recess into the ceiling with a ceiling grille (ordered separately, WindFree™ facia panel part number: PC4NUFMUN) and shall have a modulating expansion device. The WindFree™ 4-way cassette shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The WindFree™ 4-way cassette shall have an optional motion detection sensor (MCR-SMC) to enable/disable the unit based on motion with optional time delay settings. (Refer to Part 4 of this specification for more MCR-SMC details). The WindFree™ 4-way cassette shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested. Contai ned within the unit shall be all factory wiring, piping, electronic modulatin g expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen gas) before shipment from the factory.

2. The indoor unit shall include a WindFree™ function that will close the su pply air outlet louvers while in cooling mode to gently disperse cool air i nto the space through thousands of micro-holes on the fascia panel with out blowing directly onto occupants. WindFree™ operation prevents direc t airflow onto occupants thus increasing occupant comfort.

3. The WindFree™ feature is optional and can be enabled using local and central control options provided by the VRF manufacturer.

4. The indoor unit WindFree™ fascia panel shall include a humidity sensor

to prevent condensation formation by restricting WindFree™ operation in high humidity conditions.

** The WindFree™ unit delivers an air current that is under 0.15 m/s while in WindFree™ mode. Air velocity that is below 0.15 m/s is considered "still air" as defined by ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).*

C. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.

2. Service of electronics, high and low voltage connection, condensate pum p, fan, fan motor, sensors, EEV, condensate pan, and other components shall be accessible from the bottom of the cassette unit not requiring ac cess from the sides of the unit.

3. Construction shall be HIPS chassis with a galvanized steel frame and fa scia panel certified to UL94 V0.

4. Each corner portion of the panel cabinet is detachable, which gives easy access to adjust the height.

5. The cabinet shall have provisions for a field installed, filtered, outside air intake. A booster fan is necessary. A 12V DC relay terminal is available to control a booster fan (with separate PCB connector).

6. Branch ducting shall be allowed from cabinet, available on 2 sides to co ndition an adjacent area within a single room.

7. The cabinet shall have a fresh air intake opening to accommodate the in troduction of fresh air into the space.

8. The indoor unit fascia panel shall have LED indicator lights on the front and an IR receiver for wireless controller use.

D. Fan:

1. The indoor fan assembly shall be a turbo fan direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High. Auto fan speed setting is available.

4. The auto swing air outlet vanes (4) shall be capable of automatically swinging up and down for uniform air distribution.

5. The supply air vanes shall have independent control capability (32° – 65° control range) adjustable with optional wireless or wired controllers.

E. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter included with fascia panel.

2. A MERV 13 rated filter is available as an optional accessory (MF-C6A0).

F. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The coil fins are coated with hydrophilic paints.

7. The condensate lift mechanism shall be able to raise drain water 29 inches above the condensate pan with built in check valve and float switch.

8. Both refrigerant lines to the 4-way cassette indoor units shall be insulated.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, and 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

H. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-

B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.2 MERV 13 ACCESSORY FILTER FOR 4-WAY CEILING CASETTE UNITS (MF-C6A0)

1. The MERV 13 filter shall attach to cassette fascia panel without additional adapters
2. Minimal CFM loss after field programming
3. Test method: ANSI/ASHRAE 52.2
4. The optional filter shall be compatible with the DVM S 4-way Cassettes.
5. Compatible with cassette facia panel model numbers: PC4NUFMAN, PC4NUFMUN and PC4NUSKFN for AM0**RN4DCH/AA and AM0**BN4PCH/AA cassette indoor units.

4.3 WINDFREE™ MINI 4-WAY CEILING CASSETTE WITH GRILLE INDOOR UNIT (AM0**NNNDCH/AA)

A. General:

The indoor unit shall be a WindFree™ mini 4-way cassette style indoor unit that recesses into the ceiling with a ceiling grille (ordered separately, WindFree™ facia panel part number: PC4SUFMUN) and shall have a modulating expansion device. The mini 4-way cassette shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The WindFree™ mini 4-way cassette shall have an optional motion detection sensor (MCR-SMD) to enable/disable the unit based on motion with optional time delay settings. (Refer to Part 4 of this specification for more MCR-SMD details). The WindFree™ mini 4-way cassette shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

1. The indoor unit shall be factory assembled, wired and run tested. Conta ined within the unit shall be all factory wiring, piping, electronic modulati ng expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an aut o restart function. Indoor unit and refrigerant pipes shall be charged wit h dehydrated air (Nitrogen gas) before shipment from the factory.

2. The indoor unit shall include a WindFree™ function that will close the su pply air outlet louvers while in cooling mode to gently disperse cool air i nto the space through thousands of micro-holes on the fascia panel with out blowing directly onto occupants. WindFree™ operation prevents direc t airflow onto occupants thus increasing occupant comfort.

3. The WindFree™ feature is optional and can be enabled using local and central control options provided by the VRF manufacturer

4. The indoor unit WindFree™ fascia panel shall include a humidity sensor to prevent condensation formation by restricting WindFree™ operation in high humidity conditions.

** The WindFree™ unit delivers an air current that is under 0.15 m/s while in WindFree™ mode. Air velocity that is below 0.15 m/s is considered "still air" as defined by ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).*

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.

2. Service of electronics, high and low voltage connection, condensate pum p, fan, fan motor, sensors, EEV, condensate pan, and other components shall be accessible from the bottom of the cassette unit not requiring ac cess from the sides of the unit.

3. Construction shall be insulated HIPS chassis with a galvanized steel fra me and fascia panel certified to UL94 V0.

4. The cabinet panel shall have provisions for a field installed, filtered, outsi de air intake. A booster fan is necessary. A 12V DC relay terminal is available to control the booster fan (with separate PCB connector).

5. The compact cabinet size can be installed in one standard ceiling tile (2 4" x 24").

6. The indoor unit fascia panel shall have LED indicator lights on the front and an IR receiver for wireless controller use.

7. PC4SUFMUN cassette fascia panel is 24 3/8" X 24 3/8" to not overlap past a standard 24" X 24" ceiling grid.

C. Fan:

1. The indoor fan assembly shall be a turbo fan direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

1. The indoor fan shall consist of three (3) speeds, Low, Mid, and High. Auto fan speed setting is available.

3. The auto air swing vanes (4) shall be capable of automatically swinging up and down for uniform air distribution.

4. The supply air vanes shall have independent control capability (32° – 65° control range) adjustable with optional wireless or wired controllers.

5. The cabinet shall have a fresh air intake opening to accommodate the in troduction of fresh air into the space.

D. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter included with fascia panel.

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain outlet shall be provided under the coil.

6. The coil fins are coated with hydrophilic paints.

7. The condensate lift mechanism shall be able to raise drain water 29 inches above the condensate pan with float switch.

8. Both refrigerant lines to the mini four-way cassette indoor units shall be insulated.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, and 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

G. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a

supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.4 WINDFREE™ 1-WAY, CEILING CASSETTE WITH GRILLE, INDOOR UNIT (AM0**NN1DCH/AA, AM0**AN1PCH/AA)

A. General:

The indoor unit shall be a one-way cassette style indoor unit that recesses into the ceiling with a ceiling grille (ordered separately, WindFree™ facia panel part number and compatibility shown in the table below) and shall have a modulating expansion device. The one-way cassette shall be compatible with DVM S HR

(Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The WindFree™ one-way cassette shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

* *The WindFree™ unit delivers an air current that is under 0.15 m/s while in WindFree™ mode. Air velocity that is below 0.15 m/s is considered "still air" as defined by ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).*

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested. Contai ned within the unit shall be all factory wiring, piping, electronic modulatin g expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen gas) before shipment from the factory.

2. The indoor unit shall include a WindFree™ function that will close the su pply air outlet louvers while in cooling mode to gently disperse cool air i nto the space through thousands of micro-holes on the fascia panel with out blowing directly onto occupants. WindFree™ operation prevents direc t airflow onto occupants thus increasing occupant comfort.

3. The WindFree™ feature is optional and can be enabled using local and central control options provided by the VRF manufacturer

4. The indoor unit WindFree™ fascia panel shall include a humidity sensor to prevent condensation formation by restricting WindFree™ operation in high humidity conditions.

5. AM005AN1PCH/AA and AM007AN1PCH/AA Models shall fit between stan dard 16" on-center framing without framing modification.

* *The WindFree™ unit delivers an air current that is under 0.15 m/s while in WindFree™ mode. Air velocity that is below 0.15 m/s is considered "still air" as defined by ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).*

C. Unit Cabinet:

1. The cabinet shall be space-saving ceiling recessed.

2. AM005AN1PCH/AA and AM007AN1PCH/AA Models shall fit between stan dard 16” on-center framing without framing modification.

3. Service of electronics, high and low voltage connection, condensate pum p, fan, fan motor, sensors, EEV, condensate pan, and other components shall be accessible from the bottom of the cassette unit not requiring ac cess from the sides of the unit.

4. Construction shall be HIPS chassis fascia panel certified to UL94.

5. The one-way grille shall be fixed to bottom of cabinet allowing for one-w ay airflow.

6. The indoor unit fascia panel shall have LED indicator lights on the front and an IR receiver for wireless controller use.

7. The WindFree™ facia panel shall have thousands of micro-holes to allow for still air to flow and keep the space cool at set temperature without a cold draft*.

8. The required WindFree™ facia panels are noted below.

Indoor Unit Model Number	***Fascia Panel Model Number***
AM005AN1PCH/AA	PC1MWFMUN
AM007AN1PCH/AA	
AM007NN1DCH/AA	PC1NWFMUN
AM009NN1DCH/AA	
AM012NN1DCH/AA	
AM009AN1PCH/AA	
AM012AN1PCH/AA	
AM015AN1PCH/AA	PC1BWFMUN
AM018AN1PCH/AA	
AM024AN1PCH/AA	

**The WindFree™ unit delivers an air current that is under 0.15 m/s while in WindFree™ mode. Air velocity that is below 0.15 m/s is considered “still air” as defined by ASHRAE 55-2013 (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).*

D. Fan:

1. The indoor fan shall be an assembly with one line-flow fan directly driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

2. The indoor fan shall consist of three (3) speeds, Low, Mid, and High. Auto fan speed setting is available.

3. Return air shall be filtered by means of a long-life washable permanent filter (2).

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The condensate lift mechanism shall be able to raise drain water 29 inches above the condensate pan with built in check valve and float switch.

7. The coil fins are coated with hydrophilic paints.

8. Both refrigerant lines to the one-way cassette indoor units shall be insulated.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system.

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

G. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-

B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.5 360 CASSETTE INDOOR UNIT (AM0**KN4DCH/AA)

A. General:

The 360 cassette style indoor unit shall recess into the ceiling with a ceiling grille (ordered separately). The 360 Cassette indoor unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit, MCU-S*NE**N) or DVM S HP (Heat Pump) outdoor units. The 360 Cassette indoor unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems). The 360 cassette shall support individual control using SAMSUNG NASA Control Network Solution (Control systems).

1. The indoor unit shall feature a round chassis and round evaporator coil.

2. The indoor unit shall be factory assembled, wired and run tested. Contain ed within the unit shall be all factory wiring, piping, control circuit board, c ondensate pump, and fan motor.

3. The indoor unit shall include an internal condensate pump with check-valv e as standard with a maximum vertical lift of 29 inches.

4. The indoor unit shall have an integral condensate float switch to disable t he unit in the event of condensate overflow.

5. The unit shall have a self-diagnostic function, 3-minute time delay mechan ism, and an auto restart function.

6. The indoor unit refrigerant pipes shall be charged with dehydrated air (Nitr

ogen gas) before shipment from the factory.

7. The indoor unit shall be a round ceiling cassette with 360°, even air distri bution

8. The indoor units shall have a removable EEPROM that stores system pro gramming information, unit name, and other data.

9. All indoor unit addressing and option settings shall be done digitally; the i ndoor unit does not contain rotary dials or setting switches.

10. The indoor unit shall not have air louvers or blades allowing full airflow without restriction. Air direction control shall be achieved by creating a lo w pressure area near air outlet causing discharge air to change direction angle.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.

2. Construction shall be HIPS chassis with a galvanized steel frame and fas cia panel certified to UL94 V0.

3. Each corner portion of the panel cabinet is detachable, which gives easy access to adjust the height.

4. The cabinet shall have provisions for a field installed, filtered, outside air i ntake. A booster fan is necessary. A 12V DC relay terminal is available t o control a booster fan (with separate PCB connector).

5. The "ceiling type" fascia panel model PC4NUDMUN shall be square in sh ape, white, with a circular air outlet opening. This panel is designed for use in applications where the indoor unit chassis is recessed in the ceilin g with a finished ceiling textile.

6. The "ceiling type" fascia panel model PC4NBDMUN shall be square in sh ape, black, with a circular air outlet opening. This panel is designed for use in applications where the indoor unit chassis is recessed in the ceilin g with a finished ceiling textile.

7. The "open type" fascia panel model PC4NUNMUN shall be, white, circular in shape with a circular air outlet opening. This panel is designed for us e in applications where the indoor unit chassis is exposed.

8. The "open type" fascia panel model PC4NBNMUN shall be, black, circular

in shape with a circular air outlet opening. This panel is designed for us e in applications where the indoor unit chassis is exposed.

9. The fascia panel shall have LED indicator lights and an infrared receiver.

C. Fan:

3. The indoor fan assembly shall be a turbo fan, direct driven by a single motor.
4. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
5. The indoor fan shall consist of three (3) speeds, Low, Mid, and High. Auto fan speed setting is available.
6. Fixed or auto-swing air direction shall be possible with wireless, touch, or premium wired controller (10° ~ 60° angle)
7. Independent air distribution control is possible with wireless or premium wired controller (three directions, 10° ~ 60° angle).
8. Airflow direction shall be accomplished without any air blades/louvers to remove air flow restriction in the air outlet path. Instead, the cassette indoor unit shall use three (3) internal booster fans to create an area of low pressure outside of the air outlet opening causing the air to change direction. Changing air direction in this manner (Coanda effect) is superior to traditional air louvers/blades on standard 4-way cassette indoor units.

D. Filter:

1. Return air shall be filtered by means of a long-life washable permanent, electro-static filter included with fascia panel.

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan with drain pump shall be provided under the coil.

6. The coil fins are coated with hydrophilic paints.

7. The condensate lift mechanism shall be able to raise drain water 29 inches above the condensate pan with built in check valve and float switch.

8. Both refrigerant lines to the 360 cassette indoor units shall be insulated.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, and 60 hertz supplied from the condensing unit.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The indoor unit PCB contains a time-lag fuse.

4. The control circuit between the indoor units, and the outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system. The outdoor unit shall supply power to indoor unit via 14 AWG X 3 power wire

5. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

G. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this

guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.6 MULTI-POSITION, DUCTED, INDOOR UNIT (AM0**TNZDCH/AA)

A. General:

The multi-position indoor unit shall be a high-performance, high static pressure capable, multi-position ducted indoor fan coil that can install in a horizontal or vertical position and shall have a modulating expansion device (gear type). The multi-position ducted indoor unit shall be compatible with DVM S HR (Heat

Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The multi-position ducted indoor unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems). Indoor Unit.

1. The indoor unit shall be factory assembled, wired and run tested. Conta ined within the unit shall be all factory wiring, piping, electronic modulati ng expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen gas) before shipment from the factory.

2. The indoor unit shall have the ability to install optional, supplemental, ele ctric heat kits provided by the manufacturer.

3. The indoor unit shall have the ability to install an optional downflow conv ersion kit provided by the manufacturer.

4. The indoor unit shall have an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

B. Unit Cabinet:

1. The cabinet shall be constructed of insulated, painted, galvanized steel.

C. Fan:

1. Indoor fan is backward curved centrifugal type with a single constant tor que fan motor.

2. Standard external static pressure is 0.4” WC. Acceptable range: 0.1” – 0 .5” WC for 12,000 btu/h multi-position indoor units.

3. Standard external static pressure is 0.4” WC. Acceptable range: 0.1” – 0 .7” WC for 18,000 – 24,000 btu/h multi-position indoor units.

4. Standard external static pressure is 0.4” WC. Acceptable range: 0.1” – 1 .0” WC for 30,000 – 72,000 btu/h multi-position indoor units.

5. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

6. The indoor fan shall have five (5) speed taps available for adjustment.

7. The indoor fan shall consist of three (3) speeds, High, Mid, and Low. A

uto fan speed setting is available.

8. The indoor unit shall have a ducted air outlet system and ducted return air system (field provided).

D. Filtration:

1. Filtration is field provided.

2. Field provided filtration must be used within bounds of external pressure drop.

3. Optional filter bases are available.

E. Supplemental Electric Heat Kit:

1. Optional supplemental electric heat kits are available.

F. Downflow Conversion Kit:

1. Optional downflow conversion kits are available.

G. Coil:

1. The indoor coil shall be mechanically bonded fin to copper tubing.

2. All tube joints shall be brazed with phos-copper or silver alloy.

3. The coils shall be pressure tested at the factory.

4. A condensate pan and drain shall be provided under the coil for vertical or horizontal applications.

5. The condensate shall be gravity drained as standard.

H. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

I. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have a terminal to connect a 0 volt, dry contact, float switch or other device to disable the unit.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with a factory installed MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment. This option cannot be used in conjunction with simple unit shutdown with a 0 volt dry contact.

5. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

6. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired

controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

7. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.7 FILTER BASE ACCESSORY FOR MULTI-POSITION AIR HANDLING UNITS (VFB-*)

A. Compatibility:

1. Optional filter base: VFB-1 for indoor unit model numbers: AM012TNZDCH/AA, AM018TNZDCH/AA, and AM024*NZDCH/AA.

2. Optional filter base: VFB-2 for indoor unit model numbers: AM030TNZDCH/AA, AM036TNZDCH/AA.

3. Optional filter base: VFB-3 for indoor unit model numbers: AM048TNZDCH/AA, AM054TNZDCH/AA, AM060TNZDCH/AA, and AM072TNZDCH/AA.

B. General:

1. The optional filter base shall be used for vertical installation.

2. The optional filter base shall include a 1”, pleated filter as standard.

3. The optional filter base shall accommodate a 1” or 2” filter.

4.8 SUPPLEMENTAL ELECTRIC HEAT KITS FOR MULTI-POSITION AIR HANDLERS (VHK-***A)

1. Optional supplemental electric heat kits are available as noted in the table below.

Indoor Unit Model Number	***Compatible Heat Kit***	***kW***
AM012TNZDCH/AA	VHK-103A	3
AM018TNZDCH/AA, AM024TNZDCH/AA	VHK-103A	3
	VHK-105A	5
AM024TNZDCH/AA	VHK-110A	10
AM030TNZDCH/AA, AM036TNZDCH/AA	VHK-205A	5
	VHK-210A	10
AM048TNZDCH/AA	VHK-305A	5
	VHK-310A	10
AM054TNZDCH/AA, AM060TNZDCH/AA	VHK-305A	5
	VHK-310A	10
	VHK-315A	15
AM072TNZDCH/AA	VHK-305A	5
	VHK-310A	10
	VHK-315A	15
	VHK-320A	20

4.9 DOWNFLOW CONVERSION KIT ACCESSORY FOR MULTI-POSITION AIR HANDLING UNITS (VDK-*)

1. The Downflow Conversion Kit is used to change the airflow direction of a Multi Position Air Handling downward.
2. Includes two items: AHU coil door, return air temperature sensor holder
3. Electric heat kits cannot be installed when using a downflow kit.
4. Compatibility

Downflow Kit Model	***Indoor Unit Model Number***
VDK-1	AM012TNZDCH/AA[1]
	AM018TNZDCH/AA[1]
	AM024TNZDCH/AA[1]
VDK-2	AM030TNZDCH/AA[1]
	AM036TNZDCH/AA[1]

Downflow Kit Model	***Indoor Unit Model Number***
VDK-3	AM048TNZDCH/AA
	AM054TNZDCH/AA
	AM060TNZDCH/AA
	AM072TNZDCH/AA

[1]*indicated models require EEV Extension Wire Harness (DB82-05832A) purchased separately*

4.10 CEILING-CONCEALED, SLIM, DUCTED, INDOOR UNIT (AM0**FNLDCH/AA)

A. General:

The indoor unit shall be a ceiling-concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply and shall have a modulating expansion device. The ceiling-concealed ducted unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The ceiling-concealed ducted unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen gas) before shipment from the factory.

2. The indoor unit shall have a discharge air temperature sensor.

3. The indoor unit discharge temperature sensor shall allow configuration to control unit operation based on target cooling and heating discharge air temperatures (cooling: 46~64º F, heating: 86~109º F).

4. The indoor unit discharge temperature sensor reading shall be visible on central control options and manufacturer provided service software.

5. The indoor unit discharge temperature setting shall be controllable via central control options and compatible local wired controllers. The BACnet gateway controller shall also allow discharge air temperature control via

BACnet protocol.

C. Unit Cabinet:

1. The unit shall be space saving, ceiling-concealed, ducted.

2. The cabinet shall be constructed of insulated galvanized steel.

D. Fan:

1. The indoor unit fan assembly shall be two or three (dependent on capacity) Sirocco fans direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High. Auto fan speed setting is available.

4. The indoor unit shall have a ducted air outlet and ducted return air system (field provided).

5. External static pressure data is provided in the table below.

External Static Pressure ("WC)		
Model Number	***Standard***	***Acceptable Range***
AM007FNLDCH/AA	0.08"	0 – 0.16"
AM009FNLDCH/AA	0.08"	0 – 0.16"
AM012FNLDCH/AA	0.08"	0 – 0.16"
AM018FNLDCH/AA	0.08"	0 – 0.16"
AM024FNLDCH/AA	0.08"	0 – 0.16"
AM030FNLDCH/AA	0.12"	0 – 0.24"

6. The fan speed shall be adjustable by optional remote controller or manufacturer provided service software according to external static pressure.

7. The indoor unit shall only serve areas in the same room (cannot serve areas in different fire envelopes).

E. Filter:

1. Return air shall be filtered by means of a standard factory installed return air filter on rear of unit.

2. Optional return connection through rear or bottom of unit with removal and replacement of return air conversion plate. Other filtration is field provided (recommended).

F. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The condensate shall be gravity drained from the fan coil.

7. The coil fins are coated with hydrophilic paint.

8. Both refrigerant lines to the ceiling-concealed ducted indoor units shall be insulated.

9. The condensate shall be gravity drained as standard (optional, internally mounted, field installed, manufacturer provided condensate pumps available).

G. Optional SAMSUNG Condensate Pumps

1. Condensate pump model: MDP-M075GU3D

H. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

I. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification) or with the "HOT WATER" output. External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated. The "HOT WATER" output is 230 VAC. A field-provided relay will be required to control a supplemental external heat source.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.11 DUCT S MEDIUM/HIGH STATIC (CEILING-CONCEALED DUCTED) INDOOR UNIT (AM***ANMDCH/AA, AM***ANHDCH/AA)

A. General:

The indoor unit shall be a high-performance, high static pressure capable, concealed ducted indoor fan coil that mounts above the ceiling with a fixed horizontal discharge supply and shall have a modulating expansion device (gear type). The high static pressure capable, concealed ducted indoor unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The high static pressure capable, concealed ducted indoor unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit.

1. The indoor unit shall be factory assembled, wired and run tested. Contai ned within the unit shall be all factory wiring, piping, electronic modulatin g linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an d an auto restart function.

2. The indoor unit shall have a discharge air temperature sensor.

3. The indoor unit discharge temperature sensor shall allow configuration to control unit operation based on target cooling and heating discharge air

temperatures (cooling: 46~64º F, heating: 86~109º F).

4. The indoor unit discharge temperature sensor reading shall be visible on central control options and manufacturer provided service software.

5. The indoor unit discharge temperature setting shall be controllable via ce ntral control options and compatible local wired controllers. The BACnet gateway controller shall also allow discharge air temperature control via BACnet protocol.

6. The indoor unit shall have an integral condensate pump as standard wit h 29" maximum lift.

7. The indoor unit shall allow service access from four sides (top, bottom, l eft, right).

C. Unit Cabinet:

1. The unit shall be space saving, ceiling-concealed, ducted.

2. The cabinet shall be constructed of insulated galvanized steel.

D. Fan:

1. The indoor unit fan shall be an assembly with two or three Sirocco fans, depending on model, direct driven by one (1) fan motor.

2. External static pressure data is provided in the table below.

External Static Pressure ("WC)		
Capacity (Btu/h)	***Standard***	***Acceptable Range***
6,000 – 15,000	0.04"	0 – 0.59"
18,000	0.04"	0 – 0.79"
24,000 – 48,000	0.2"	0.12 – 0.79"

3. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

4. The indoor fan shall consist of three (3) speeds, High, Mid, and Low. Auto fan speed setting is available.

5. The indoor unit shall have a ducted air outlet system and ducted return air system.

6. The fan speed shall be adjustable by optional remote controller or manufacturer provided service software according to external static pressure.

7. The indoor unit shall have static pressure scanning for simple setup and optimized comfort settings for the occupant.

8. The indoor unit shall have smart-tuning function that can provide optimized comfort by allowing the occupant to offset the fan CFM curve with a compatible wired remote controller to increase or decrease airflow.

E. Filter:

1. Air filtration is field provided.

2. Optional return filter box (rear placement) is available.

F. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The condensate shall be gravity drained from the fan coil.

7. Both refrigerant lines to the AM0**ANMDCH/AA and AM0**ANHDCH/AA indoor units shall be insulated.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage tolerance is ±10%.

H. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls"

section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification) or with the "HOT WATER" output. External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated. The "HOT WATER" output is 230 VAC. A field-provided relay will be required to control a supplemental external heat source.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.12 HIGH STATIC (CEILING-CONCEALED), DUCTED INDOOR UNIT (AM054JNHDCH/AA, AM076FNHDCH/AA, AM096FNHDCH/AA)

A. General:

The indoor unit shall be a high-performance, high static pressure capable, concealed ducted indoor fan coil that mounts above the ceiling with a fixed horizontal discharge supply and shall have a modulating expansion device (gear type). The high static pressure capable, concealed ducted indoor unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The high static pressure capable, concealed ducted indoor unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit.

1. The indoor unit shall be factory assembled, wired and run tested. Contai ned within the unit shall be all factory wiring, piping, electronic modulatin g linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an d an auto restart function.

2. The indoor unit shall have a discharge air temperature sensor.

3. The indoor unit discharge temperature sensor shall allow configuration to control unit operation based on target cooling and heating discharge air temperatures (cooling: 46~64ºF, heating: 86~109ºF).

4. The indoor unit discharge temperature sensor reading shall be visible on central control options and manufacturer provided service software.

5. The indoor unit discharge temperature setting shall be controllable via ce

ntral control options and compatible local wired controllers. The BACnet gateway controller shall also allow discharge air temperature control via BACnet protocol.

C. Condensate Pumps

1. The AM054JNHDCH/AA indoor unit shall have an integral condensate pu mp as standard with 29" maximum lift.

2. Optional condensate pump model MDP-N047SNC1D is available for AM076FNHDCH/AA and AM096FNHDCH/AA indoor unit models.

D. Unit Cabinet:

1. The unit shall be space saving, ceiling-concealed, ducted.

2. The cabinet shall be constructed of insulated galvanized steel.

E. Fan:

1. The AM054JNHDCH/AA indoor unit fan assembly shall consist of two Sirocco fans direct driven by two (2) fan motors.

2. The AM076FNHDCH/AA and AM096FNHDCH/AA indoor unit fan assembly shall consist of two Sirocco fans direct driven by one (1) fan motor.

3. External static pressure data is provided in the table below.

External Static Pressure ("WC)		
Model Number	***Standard***	***Acceptable Range***
AM054JNHDCH/AA	0.2"	0.12 – 0.63"
AM076FNHDCH/AA	0.59"	0.20 – 0.98"
AM096FNHDCH/AA	0.59"	0.20 – 1.10"

4. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

5. The indoor fan shall consist of three (3) speeds, High, Mid, and Low. Auto fan speed setting is available.

6. The indoor unit shall have a ducted air outlet system and ducted return air system.

7. The fan speed shall be adjustable by optional remote controller or manufacturer provided service software according to external static pressure.

F. Filter:

1. Return air shall be filtered by means of a standard factory installed return air filter.

2. Optional return filter box (rear placement) is available.

G. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The condensate shall be gravity drained from the fan coil.

7. Both refrigerant lines to the AM054JNHDCH/AA and AM0**FNHDCH/AA indoor units shall be insulated.

H. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage tolerance is ±10%.

I. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification) or with the "HOT WATER" output. External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated. The "HOT WATER" output is 230 VAC. A field-provided relay will be required to control a supplemental external heat source.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal

can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.13 FILTER BOX ACCESSORY FOR DUCT S, HIGH STATIC, AND OAP INDOOR UNITS

1. Optional return filter box (rear placement) shall be available for all AM***AN*DCH/AA indoor units as noted in the table below.

Capacity (Btu/h)	***Filter Box Model Number***
6,000 – 15,000	FB-DS1
18,000 – 30,000	FB-DS2
36,000 – 48,000	FB-DS3
54,000	FB-M48/H3648
76,000 – 96,000 HSP	FB-H7696
72,000 – 96,000 OAP	FB-OAP

2. The filter box shall accommodate a 1" or 2" wide filter.

4.14 WINDFREE™ HIGH WALL INDOOR UNIT (AM0**TNVDCH/AA)

A. General:

The wall-mounted indoor unit section shall have a slim silhouette. The wall-mounted indoor unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit, MCU-S*NE**N) or DVM S HP (Heat Pump) outdoor units. The wall-mounted indoor unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems

Indoor Unit:

1. The indoor unit shall feature WindFree™ operation. WindFree™ mode will close the air outlet louver and disperse air into the space through thousands of micro-holes on the front of chassis and the air outlet louver keeping the space cool without cold drafts. The WindFree™ unit delivers an air current that is under 0.15 m/s while in WindFree™ mode. Air velocity that is below 0.15 m/s is considered "still air" as defined by ASHRAE 55-2013 (American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

2. WindFree™ mode only operates in Cooling and Dry modes.

3. The indoor unit shall automatically enter WindFree™ mode, as the room temperature approaches set temperature, when 2-Step cooling function is set.

4. The indoor unit can be manually put into "WindFree™" mode with an optional wired controller, wireless controller, or central control.

5. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuit board and fan motor.

B. Unit Cabinet:

1. The casing shall have a gloss white finish, HIPS chassis certified to UL9 4 V0.

2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and four (4) directions for draining shall be standard.

3. Drain hose shall be on the right-hand side of the drain pan (when facing the front) as standard with optional left-hand side connection.

4. There shall be a separate galvanized steel mounting plate which secures the unit firmly to the wall.

5. The indoor unit shall have easy-access pipe and drain connections via a ccess panel on front of unit for easier installation and service allowing m aintenance without pulling the unit out from the wall thus preventing pro perty damage.

6. Two digit, 7-segment display on the front of the unit, shall provide unit o peration, temperature, and error status.

C. Fan:

1. The indoor fan assembly shall be a cross-flow fan direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. Motorized air sweep louvers shall provide automatic change in airflow by directing the air up and down and left to right to provide uniform air distribution.

4. The indoor fan shall consist of three (3) speeds, High, Mid, and Low. Auto fan speed setting is available.

D. Filter:

1. Return air shall be filtered by means of an electro-static, pleated, easily removable, washable filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The coil fins are coated with hydrophilic paints.

7. Both refrigerant lines to the wall-mounted indoor unit shall be insulated.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system.

4. The indoor unit shall have a thermal fuse under the high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

G. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have An EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a

signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.15 MAX HIGH WALL INDOOR UNIT (AM032MNQDCH/AA)

A. General:

The wall-mounted indoor unit section shall have a slim silhouette. The wall-mounted indoor unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit, MCU-S*NE**N) or DVM S HP (Heat Pump) outdoor units. The wall-mounted indoor unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems

Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuit board and fan motor.

B. Unit Cabinet:

1. The casing shall have a gloss white finish, HIPS chassis certified to UL9 4 V0.
2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and four (4) directions for draining shall be standard.
3. Drain hose shall be on the right-hand side of the drain pan (when facing the front) as standard with optional left-hand side connection.
4. There shall be a separate galvanized steel mounting plate which secures the unit firmly to the wall.
5. The indoor unit shall have easy-access pipe and drain connections via a ccess panel on front of unit for easier installation and service allowing m aintenance without pulling the unit out from the wall thus preventing pro perty damage.

C. Fan:

1. The indoor fan assembly shall be a cross-flow fan direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. Motorized air sweep louvers shall provide automatic change in airflow by directing the air up and down to provide uniform air distribution.

4. The indoor fan shall consist of three (3) speeds, High, Mid, and Low. Auto fan speed setting is available.

D. Filter:

1. Return air shall be filtered by means of an electro-static, pleated, easily removable, washable filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The coil fins are coated with hydrophilic paints.

7. Both refrigerant lines to the wall-mounted indoor unit shall be insulated.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using

stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system.

4. The indoor unit shall have a thermal fuse under the high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

G. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have An EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired

controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.16 UNDER CEILING/WALL INDOOR UNIT (AM0**FNCDCH/AA)

A. General:

The under-ceiling/wall indoor unit shall be installed under ceiling or on wall (near floor). The under-ceiling/wall indoor unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The under-ceiling/wall indoor unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested. Contai ned within the unit shall be all factory wiring, piping, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. The unit shall have a s ingle auto-swing louver. Indoor unit and refrigerant pipes shall be charg ed with dehydrated air (Nitrogen gas) before shipment from the factory. Gravity drain as standard.

C. Unit Cabinet:

1. The cabinet shall be space-saving, under-ceiling type that can also be in stalled on a wall (near floor).

2. The casing shall be HIPS certified to UL94 V0.

3. The casing shall have a white finish.

4. There shall be separate galvanized steel mounting hangers that will secu re the unit firmly to wall (wall-mounted applications only).

5. The indoor shall have LED indicator lights on the front and an IR receiver for wireless controller use.

D. Fan:

1. The indoor fan assembly shall be a Sirocco fan (2) direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.

4. The auto air swing louver shall be capable of automatically swinging up and down for uniform air distribution.

E. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain outlet shall be provided under the coil (gravity drain).

6. The coil fins are coated with hydrophilic paints.

7. Both refrigerant lines to the under-ceiling/wall indoor unit indoor units shall be insulated.

8. The AM0**FNCDCH/AA unit shall require an external expansion valve (MXD-E**K***A or MEV-A**SA)

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, and 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

H. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be

done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.17 ELECTRONIC EXPANSION VALVE KIT (SINGLE ZONE) FOR UNDERCEILING/WALL INDOOR UNITS (MEV-A**A)

A. General:

The MEV-A**SA device is a single zone electronic expansion valve for Samsung DVM S under-ceiling units (AM0**FNCDCH/AA). Compatible with DVM S heat pump systems (AM****X***H*AA) and DVM S Heat Recovery systems (AM****X***R*AA). The MEV-A**SA EEV installs inline on the liquid line for a single unit. It must be located nearby the unit, within 7 feet (of pipe) between the MEV-A**SA and the connected indoor unit. The appropriate expansion valve should be selected based on the capacity of the connected unit per the table below.

EEV Kit Model Number	***Connectable Capacity (Btu/h)***
MEV-A24SA	≤ 12,000

EEV Kit Model Number	Connectable Capacity (Btu/h)
MEV-A32SA	18,000 – 24,000

B. Cabinet:

1. The chassis shall be fabricated of galvanized steel and HIPS certified to UL94 V0.

C. Refrigerant:

1. For R410A systems only.

D. Electrical:

1. The single zone EEV is powered and controlled directly from the indoor unit that it is metering refrigerant to via included wire harness.

4.18 UNDER CEILING INDOOR UNIT ("BIG CEILING", AM0**JNCDCH/AA)

A. General:

The under-ceiling indoor unit shall be installed under ceiling (fixed to the ceiling). The under-ceiling indoor unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The under-ceiling indoor unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested. Contai ned within the unit shall be all factory wiring, piping, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. The unit shall have a s ingle auto-swing louver. Indoor unit and refrigerant pipes shall be charg ed with dehydrated air (Nitrogen gas) before shipment from the factory. Gravity drain as standard.

C. Unit Cabinet:

1. The cabinet shall be space-saving, under-ceiling type.

2. The casing shall be HIPS certified to UL94 V0 with a galvanized steel c hassis.

3. The casing shall have a white finish.

4. The unit chassis shall allow access to refrigerant pipes, drain pipe, high voltage, and low voltage from one side of the unit for ease of installatio n and service.

5. The indoor unit chassis shall have LED indicator lights and IR receiver (f or wireless remote use) as standard.

6. Gravity drain as standard.

D. Fan:

1. The AM036JNCDCH/AA indoor fan assembly shall be a Sirocco fan (3) direct driven by a single motor.

2. The AM048JNCDCH/AA indoor fan assembly shall be a Sirocco fan (4) direct driven by a single motor.

3. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

4. The indoor fan shall consist of three (3) speeds, High, Mid, and Low. Auto fan speed setting is available.

5. The auto air swing louver shall be capable of automatically swinging up and down for uniform air distribution.

6. The indoor unit is designed for extended air throw across large areas.

E. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain outlet shall be provided under the coil (gravity drain).

6. The coil fins are coated with hydrophilic paints.

7. Both refrigerant lines to the under-ceiling indoor unit shall be insulated.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, and 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

H. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set

temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.19 CASED FLOOR STANDING INDOOR UNIT (AM0**JNGDCH/AA)

A. General:

The indoor unit shall be a "cased" floor standing style indoor unit and shall have a modulating expansion device. The floor standing unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The floor standing unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit.

1. The indoor unit shall be factory assembled, wired and run tested. Conta ined within the unit shall be all factory wiring, piping, electronic modulati ng expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an aut o restart function. Indoor unit and refrigerant pipes shall be charged wit h dehydrated air (Nitrogen gas) before shipment from the factory.

C. Unit Cabinet:

1. The cabinet shall be constructed of insulated, galvanized steel.

2. The cabinet construction shall be HIPS chassis fascia panel certified to UL94.

D. Fan:

1. The indoor unit fan assembly shall have two (2) Sirocco fans direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High. Auto fan speed setting is available.

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The coil fins are coated with hydrophilic paints.

7. Both refrigerant lines to the floor standing indoor units shall be insulated.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, and 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

G. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls"

section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.20 CONCEALED FLOOR STANDING INDOOR UNIT (AM0**JNFDCH/AA)

A. General:

The indoor unit shall be a concealed floor standing style indoor unit and shall have a modulating expansion device. The concealed floor standing unit shall be compatible with DVM S HR (Heat Recovery) outdoor units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The floor standing unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit.

1. The indoor unit shall be factory assembled, wired and run tested. Conta ined within the unit shall be all factory wiring, piping, electronic modulati ng expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an aut o restart function. Indoor unit and refrigerant pipes shall be charged wit

h dehydrated air (Nitrogen gas) before shipment from the factory.

C. Unit Cabinet:

1. The cabinet shall be constructed of insulated, galvanized steel.

2. The cabinet construction shall be HIPS chassis fascia panel certified to UL94.

D. Fan:

1. The indoor unit fan assembly shall have two (2) Sirocco fans direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High. Auto fan speed setting is available.

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The coil fins are coated with hydrophilic paints.

7. Both refrigerant lines to the concealed floor standing indoor units shall be insulated.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, and 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

G. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The indoor unit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in

"unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.21 CEILING-CONCEALED, OAP (OUTSIDE AIR PROCESSING) DUCTED, INDOOR UNIT (AM0**JNESCH/AA)

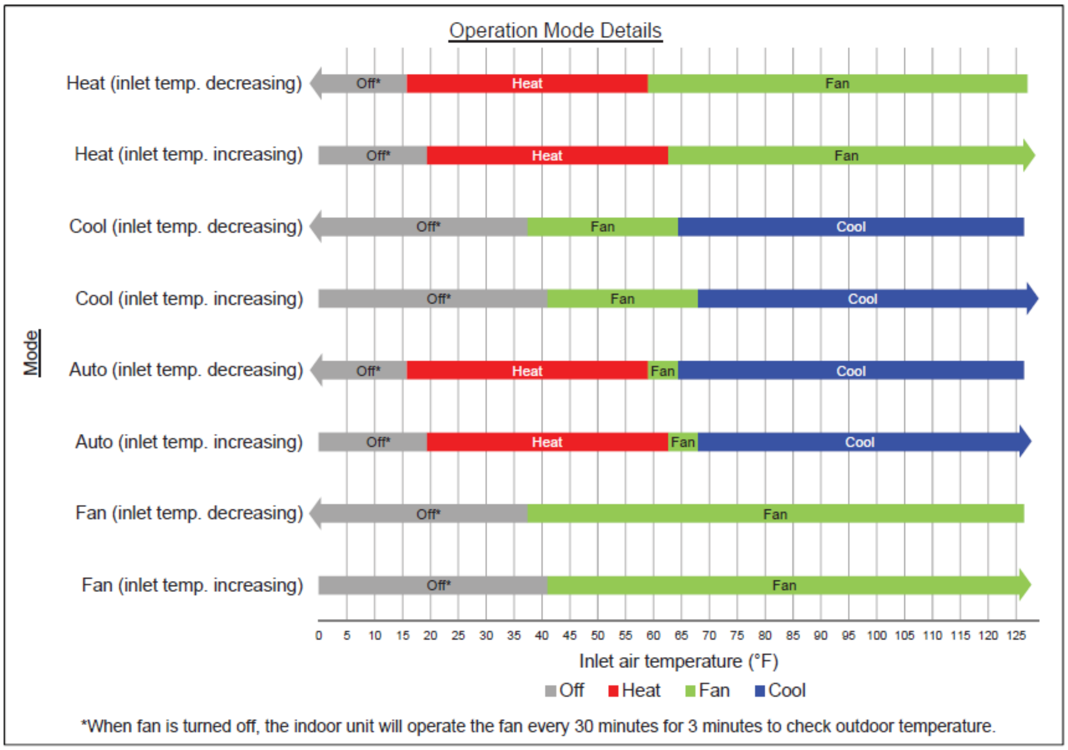
A. General:

The indoor unit shall be a ceiling-concealed OAP ducted indoor fan coil design that mounts above the ceiling with a fixed horizontal discharge supply and shall have a modulating expansion device. The ceiling-concealed OAP ducted unit shall be compatible with DVM S HP (Heat Pump) outdoor units only (Heat Recovery connection is not allowed). The ceiling-concealed OAP ducted unit shall support individual control using SAMSUNG DVM S NASA Control Network Solution (Control systems).

B. Indoor Unit:

1. The indoor unit shall be factory assembled, wired and run tested. Conta ined within the unit shall be all factory wiring, piping, electronic modulati ng expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen gas) before shipment from the factory.

2. The OAP duct shall operate in the conditions detailed below.



3. The OAP duct indoor unit shall be used to supply the space with 100%
   fresh air. The OAP duct indoor unit shall not be the main source of he
   ating and cooling for the space.

4. Multiple OAP duct units can be installed on a single system.

5. The indoor unit can be installed on the same system as other types of i
   ndoor units (ex: cassettes, wall, etc.). When OAP duct is installed on th
   e same system as other types of units, the total OAP nominal capacity
   cannot exceed 30% of the outdoor unit nominal capacity.

6. Systems with OAP connected cannot exceed 100% design diversity (ratio of outdoor unit nominal capacity vs. indoor unit nominal capacity).

7. The indoor unit shall have a discharge air temperature sensor.

8. The indoor unit discharge temperature sensor shall allow configuration to control unit operation based on target cooling and heating discharge air temperatures.

9. The indoor unit discharge temperature sensor reading shall be visible on

central control options and manufacturer provided service software.

C. Unit Cabinet:

1. The unit shall be space saving, ceiling-concealed, ducted.

2. The cabinet shall be constructed of insulated galvanized steel.

D. Fan:

1. The indoor unit fan assembly shall have two (2) Sirocco fans direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

3. The indoor fan shall have a single (1) fan speed.

4. The indoor unit shall have a ducted air outlet and ducted return air system (field provided).

5. External static pressure data is provided in the table below.

External Static Pressure ("WC)		
Model Number	***Standard***	***Acceptable Range***
AM072JNESCH/AA	0.98"	0.2 – 1.18"
AM096JNESCH/AA	0.98"	0.2 – 1.18"

E. Filter:

1. Return air shall be filtered by means of a standard factory installed return air filter on rear of unit.

2. Optional filter box is available (model: FB-OAP). This filter box shall accommodate a 1" – 3" filter (field provided).

F. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The coil fins are coated with hydrophilic paint.

7. Both refrigerant lines to the ceiling-concealed ducted indoor units shall be insulated.

8. The condensate shall be gravity drained as standard (optional, internally mounted, field installed, manufacturer provided condensate pumps available).

G. Optional SAMSUNG Condensate Pumps

1. Condensate pump model: MDP-G075SP

H. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, and 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units and the heat pump outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4. The indoor unit shall have a thermal fuse under high-voltage terminal block to disable unit in the event of overheating due to electrical malfunction/poor connection.

I. Controls:

1. This unit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The OAP duct indoor unit shall have damper control output to activate an inlet air damper.

3. The indoor unit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

4. The indoor unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The indoor unit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.22 UNIVERSAL COMMUNICATION KIT FOR CONNECTION TO THIRD-PARTY AIR HANDLING UNITS (MCM-D211UN)

A. General:

The MCM-D211UN Universal Communication Kit (UCK) is an adaptor control PCB that allows connection of custom, third-party air handling units (AHU) to DVM S Systems. Each UCK can accommodate connection of 1-4 electr onic expansion valves (EEV) to control refrigerant through the evaporator co il(s). The UCK shall be compatible with DVM S HR (Heat Recovery) outdo or units and MCU (Mode Control Unit) or DVM S HP (Heat Pump) outdoor units. The UCK shall support individual control using SAMSUNG DVM S N

ASA Control Network Solution (Control systems).

1. The Universal Communication Kit shall include 1 X control PCB mounted on a galvanized metal plate with pull restraints, 1 X evaporator inlet se nsor and pipe holder, 1 X evaporator outlet sensor with pipe holder, 1 X discharge air temperature sensor, 1 X return air temperature sensor, ins ulation, and other fasteners.

2. The Universal Communication Kit can be used for standard air handling units or for 100% outside air systems. Single kit capacity range: 7,000 Btu/h ~ 480,000 Btu/h.

3. When connected to air cooled Heat Recovery systems and configured as a DOAS (100% outside air) unit, the heat recovery condensing unit sha ll have the capability to operate both cooling and reheat coils at up to 1 25°F (51.7°C) outside ambient temperatures.

4. Multiple Universal Communication Kits can be connected to a single air handling unit

5. Multiple Universal Communication Kits can be connected to a single DV M S system.

6. The Universal Communication Kit shall provide an optional economizer o utput for connection to activate third party economizer controller (cooling thermal-ON output, field provided)

7. The Universal Communication Kit shall provide an optional free cooling i nput that can be used with economizer controller to let UCK know it is providing "free cooling" to shut outdoor off and still operate fan and prov ide a cooling mode set temperature.

8. The Universal Communication Kit shall allow connection of an enthalpy s ensor (field provided).

9. The Universal Communication Kit shall provide an optional ventilation da mper control with 2~10VDC output with customizable settings.

10. The Universal Communication Kit shall provide an optional DOAS settin g that can be used as standard AHU that uses indoor air or DOAS that uses 100% outside air

11. The Universal Communication Kit shall provide an optional simple BMS control can be used to control set temperature or discharge air temperat

ure when using discharge air control (0~10VDC input). Mode can also b e changed with dry contact input (cool, heat, auto)

12. All addressing and option settings shall be done digitally; the indoor uni t shall not contain rotary dials or setting switches.

13. The Universal Communication Kit shall have a removable EEPROM that stores system programming information, unit name, and other data

14. The Universal Communication Kit shall have an IR receiver and digital display to allow programming with a wireless controller and for simple d ata viewing

B. Fan:

1. The Universal Communication Kit shall provide Low, Medium, and High f an speed dry output contacts to control the third-party AHU fan. MCM-D211UN can also be configured to only use one (1) fan speed.

C. Requirements:

1. Each Universal Communication Kit will require at least one (1) Electronic Expansion Valve (EEV) based on connected coil capacity and coil circuit design. EEV selection shall be based on the VRF manufacturer's publis hed guidelines.

2. The third-party evaporator coil(s) must be designed within the VRF manu facturer's published guidelines.

D. Electrical:

1. The unit electrical power shall be 24 volts AC.

2. The control circuit between the indoor units, MCU (Mode Control Unit) and the heat pump/heat recovery outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

E. Controls:

1. The Universal Communication Kit shall use controls provided by the VRF manufacturer to perform functions necessary to operate the system. Please refer to the "Controls" section of this guide specification for details on controllers and other control options.

2. The Universal Communication Kit shall have a removable EEPROM on its PCB to store all unit data. All data on the indoor unit EEPROM shall be viewable from the manufacturer provided service software. The indoor unit main EEPROM shall be removable allowing replacement of indoor unit PCB without losing digital, field programmed data. The indoor unit removable EEPROM shall store the following unit data: unit model number, unit serial number, unit PCB firmware and MICOM version, and field programmed unit name/tag viewable on controls and service software.

3. The Universal Communication Kit shall have advanced external heater control programming capability for supplemental heat. External heat control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). External heat control signal shall enable and disable a supplemental heat source based on selectable room temperature and set temperature differences. External heat control signal shall include a selectable time delay before the supplemental external heat source is activated.

4. The Universal Communication Kit unit shall have advanced unoccupied room control capability. Unoccupied room control can be used to reduce system demand when a room is not occupied by changing zone settings. Unoccupied room control shall be done with MIM-B14 external contact control module (refer to the "Controls" section of this guide specification). The unoccupied settings can be modified central control gateways provided by the VRF manufacturer or programmed with the manufacturer provided service software. Unoccupied room control shall provide four setting options to modify indoor unit operation when in "unoccupied mode". Settings shall include indoor unit ON/OFF, fan speed, and set temperature adjustment.

5. The Universal Communication Kit shall feature a Dual Set point function that allows users to set separate heating and cooling set temperatures using MWR-WG00UN wired controller and central control options MIM-D01AUN, MIM-B17BUN, and MIM-B18BUN. Dual set temperature allows the user to specify a deadband where the unit will not heat or cool when room temperature is between the heating and cooling set temperatures. Dual set temperature can be used with heat pump or heat recovery systems.

6. The Universal Communication Kit shall feature an Emergency Temperature Output (ETO) function that will provide a signal when an indoor unit is in error status. When enabling ETO, a high room temperature threshold can also be programmed to provide a signal when the room temperature limit has been exceeded. The ETO signal can be used to activate backup systems, provide a simple signal to a building management system, or to provide a simple

visual/audible notification locally (ex: LED, buzzer, etc.). An MIM-B14 External Contact Control interface module is required for each unit that will provide or receive an ETO signal.

4.23 FRESH ACCESS™ SPLIT DOAS (DEDICATED OUTSIDE AIR SYSTEM, ACL-**0NN)

A. General

Split DOAS (Dedicated Outside Air System) shall be a Fresh Access™ prod uct. The unit is designed to introduce 100% outside air to a building. Fresh Access™ "AM" commercial series shall be used as the basis of design. The Fres h Access™ Split DOAS models consist of a Samsung DVM S Heat Recovery conde nser, Samsung MCU (mode control unit), and an air handler with a Variable Freque ncy Drive (VFD) to control the fan speed that is specifically engineered to pair with Samsung equipment. Connected heat recovery condensers are available in 208/230 V, 3Ø and 460V, 3Ø. The Split DOAS models are designed for easy installation with minimal field controller configuration.

1. The Split DOAS air handling unit shall include a cooling coil and a reheat coil.

2. The Split DOAS air handling unit shall include discharge air control.

3. The Split DOAS air handling unit shall have the capability to operate both cooling and reheat coils at up to 125°F (51.7°C) outside ambient temperatures when connected to a Heat Recovery condensing unit.

B. Requirements

1. The Split DOAS indoor unit shall be used to supply the space with 100 % fresh air. The Split DOAS indoor unit shall not be the main source of heating and cooling for the space.

2. Each model shall be connected to a designated outdoor unit according t o the table:

DOAS AHU Model Number	Outdoor Unit Compatibility	Outdoor Unit Type
ACL-120NN	AM096BXVGFR/AA	DVM S2 230V
	AM096BXVGJR/AA	DVM S2 460V
	AM096HXWAFR*AA	DVM S Water 230V
	AM096HXWAJR*AA	DVM S Water 460V
ACL-200NN	AM168BXVGFR/AA	DVM S2 230V
	AM168BXVGJR/AA	DVM S2 460V

DOAS AHU Model Number	***Outdoor Unit Compatibility***	***Outdoor Unit Type***
	AM168HXWAFR*AA	DVM S Water 230V
	AM168HXWAJR*AA	DVM S Water 460V
ACL-300NN	AM240BXVGFR/AA	DVM S2 230V
	AM240BXVGJR/AA	DVM S2 460V
	AM240KXWAFR*AA	DVM S Water 230V
	AM240KXWAJR*AA	DVM S Water 460V

3. A heat recovery Mode Control Unit (MCU) is required for each system r eheat coil.

DOAS AHU Model Number	***Required MCU***
ACL-120NN	MCU-S4NEK3N
ACL-200NN	MCU-S2NEK2N
ACL-300NN	MCU-S2NEK2N

C. Performance

1. The Split DOAS shall perform as indicated below:

(a) Each system shall perform in accordance to the ratings shown in the table below.

(b) Incoming air must be preheated if below 23°F before entering the split DOAS unit.

(c) The cooling coil will only operate in cooling mode. The reheat coil will only operate in heating mode.

DOAS AHU Model Number	***Main Coil Capacity***	***Reheat Coil Capacity***
ACL-120NN	88,800	61,800
ACL-200NN	146,800	98,700
ACL-300NN	221,900	108,000

Performance shall be based on equivalent refrigerant piping: 25', height difference: 0'

- Main coil cooling capacity: Entering air temperature 95°F DB, 75°F WB
- Reheat coil heating capacity: Entering air temperature 52.5°F DB

D. Piping:

1. The VRF equipment manufacturer's Y-joint fittings must be used to branch the main refrigerant lines from the condenser to the different coils in the split DOAS unit.

2. The VRF equipment manufacturer's Tee fittings must be used to connect outdoor units for modular systems (system with more than one outdoor unit).

E. Unit Cabinet:

1. The cabinet shall be constructed of double wall, insulated galvanized ste el.

F. Fan:

1. The indoor unit fan assembly shall have one (1) plenum fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
3. The indoor fan shall have a single three (3) fan speeds. The indoor unit can be configured to operate with only one fan speed.
4. The indoor unit shall have a ducted air outlet and ducted return air system (field provided).
5. External static pressure data is provided in the table below.

DOAS AHU Model Number	***Maximum External Static Pressure ("WC)***
ACL-120NN	2.5"
ACL-200NN	2.4"
ACL-300NN	2.4"

A. Filter:

1. Return air shall be filtered by means of pleated factory installed pleated air filters
2. The indoor unit shall include an integral return air filter rack located at the air inlet side of the unit and shall accommodate filter 1-3" thick.

B. Coil:

1. The indoor coils shall be of nonferrous construction with slit fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coils.

6. The condensate shall be gravity drained from the fan coil.

7. All refrigerant lines to the indoor unit shall be insulated.

C. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, and 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

3. The control circuit between the indoor units and the heat pump outdoor unit shall be 0.5VDC - 7VDC completed using stranded, annealed copper conductor, two-core, 16 AWG, shielded cable to provide total integration of the system

4.24 FRESH ACCESS™ ENERGY RECOVERY VENTILATOR (ERV, AN***NSEDAV/AA)

A. General:

Energy recovery ventilator (ERV) shall be a Fresh Access™ unit or approve d equal provided all specifications are met. Fresh Access™ "AN" commerci al series shall be used as the basis of design.

B. Requirements:

1. Unit shall be CSA Certified to safety standards CSA C22.2 No. 113 Fans and Ventilators and UL 1812 Ducted Heat Recovery Ventilators.

2. The ERV shall be 120VAC, 1Ph., 60Hz. unit

3. Exhaust discharge and outside air intake shall be located on the same s ide.

4. The unit shall be capable of transferring both sensible and latent heat b

etween the fresh and stale air streams.

5. The energy recovery core shall be manufactured from a flame rated poly mer membrane.

C. Performance:

1. The ERV shall be capable of operating with outside ambient temperature s between -13°F to 104°F.

2. The ERV shall be perform as indicated below:

Model Number	Nominal Airflow @ 0.4 in. WG (CFM)
AN035NSEDA/AA	465
AN075NSEDA/AA	700
AN120NSEDA/AA	1300

AN035NSEDA/AA	Supply Temperature	Net Airflow	Effectiveness	
			Sensible	Latent
	°F (°C)	CFM	%	%
Heating	35 (1.67)	560	57	35
	35 (1.67)	420	61	40
Cooling	95 (35)	560	57	32
	95 (35)	420	61	37

AN075NSEDA/AA	Supply Temperature	Net Airflow	Effectiveness	
			Sensible	Latent
	°F (°C)	CFM	%	%
Heating	35 (1.67)	840	57	35
	35 (1.67)	630	61	40
Cooling	95 (35)	840	57	32
	95 (35)	630	61	37

AN120NSEDA/AA	Supply Temperature	Net Airflow	Effectiveness	
			Sensible	Latent
	°F (°C)	CFM	%	%
Heating	35 (1.67)	840	57	35
	35 (1.67)	630	61	40
Cooling	95 (35)	840	57	32

AN120NSEDA/AA	Supply Temperature	Net Airflow	Effectiveness	
			Sensible	Latent
	°F (°C)	CFM	%	%
	95 (35)	630	61	37

D. Cabinet:

1. Cabinet shall be constructed of G90 galvanized, 20-gauge steel sheet with lapped corners. All exposed surfaces shall be coated with baked powder paint. All seams shall be sealed, requiring no sealing at the job site.

2. The unit shall be fitted with a full length drain pan for controlled conden sate drainage including two drains connections with ½ inch (12.7 mm) b arbed fitting for easy connection.

3. Unit casing shall be insulated with 1-inch (25 mm) fiberglass with FSK f acing. AN120NSEDAV/AA is insulated with 2-inch (50 mm) of foil-faced h igh-density polystyrene foam on the outdoor air side for condensation co ntrol. The flame spread index of the insulation material shall not be over 25 and its smoke developed index shall not be over 50 when tested in accordance with the Standard for Tests for Surface Burning Characterist ics of Building Material, UL723. Insulation shall be secured to unit with waterproof adhesive and permanent mechanical fasteners.

E. Energy Recovery Core

1. The energy recovery core shall be manufactured from a flame rated poly mer membrane which is designed to transfer sensible and latent energy. The flame spread index of the energy recovery core shall not be over 25 and its smoke developed index shall not be over 50 when tested in accordance with the Standard for Tests for Surface Burning Characteristi cs of Building Material, UL723.

2. Energy recovery core features polymer membrane with ISO 846 certified antimicrobial protection.

3. The energy recovery core shall be freeze tolerant and water washable.

4. Energy recovery core shall be AHRI listed for performance.

F. Frost Control:

1. A preset frost control sequence is initiated if the outdoor air temperature

falls below the set point of 23°F (-5°C). During the initial stage, the sup ply blower shuts down & the exhaust blower switches into high speed to eliminate frost build-up in the core. The unit then returns to normal ope ration for the final stage of the frost control sequence at which time the sequence is repeated if the outdoor air temperatures is still below the s et point.

G. Electrical:

1. Electrical box shall be isolated from the airflows and all integral wires an d connections protected.

2. All internal electrical components shall be factory wired for single point p ower connection.

3. All electrical components shall be UL Listed or Recognized and CSA Cer tified or Accepted where applicable and wired in compliance with the Na tional Electrical Code.

H. Fan Sections and Motors:

1. Fans shall be Ebm-Papst backward inclined motorized impellers.

2. Fan motor shall have maintenance-free permanently lubricated sealed bal l bearings.

3. Fan motor shall be (TOP) thermal overload protected.

4. Fan motor shall be UL listed to UL1004 and/or UL2111, CSA C22.2 No. 77 and No.100.

5. Fan motor shall have IP protection class 44 according to DIN 40 050.

6. Separate fans for exhaust and supply blowers shall be provided.

I. Filters:

1. The exhaust and fresh air streams shall both be protected by MERV1 w ashable filters constructed to meet UL 900.

J. Controllers

1. The ERV shall be controlled by the Eco Touch wall mounted controller

2. The Eco Touch controller shall have a blue backlit touchscreen display

3. The Eco Touch controller shall be powered by 12VDC, 2 wire connection

4. The Eco Touch controller shall have 3 ventilation modes: VENTILATION, RECIRCULATION, and STANDBY/OFF.

5. The ERV shall be able to integrate into Samsung Central Controllers wh en connected to MXD-K200VN Samsung ERV Kit and MIM-N10 Samsun g ERV interface module.

6. One MXD-K200VN per Fresh Access™ ERV unit.

7. Maximum 16 MXD-K200VN ERV kits per MIM-N10 interface module.

K. Installation

1. Unit shall be rod mounted or seated on a platform.

2. Flanged connection shall be provided for suitable ductwork connection.

3. Unit shall be adaptable for easy service of electrical components.

L. Serviceability:

1. Unit shall have hinged and/or screwed access panels on front and back.

2. Cores, filters and motors shall be serviceable from either side of the unit .

3. Fan assemblies shall be mounted on a removable sliding base. Heat rec overy core and filters shall be mounted in slide-out rails for ease of insp ection, removal, and cleaning.

4. Accessibility to the electrical box shall be maintained for any unit installat ion.

M. Warranty:

1. Fresh Access™ ERV's have a warranty that is limited to 3 years on all parts from the date of install, including parts replaced during this time p eriod. If there is no proof of purchase available, the date associated wit h the serial number will be used for the beginning of the warranty perio d

5. CONTROLS

5.1 CONTROLS OVERVIEW

A. General:

The DVM S Controls Network Solution shall be capable of supporting remote controllers, schedule timers, system controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® and LonWorks®.

B. Electrical Characteristics:

1. General:

(a) Local DVM S Controls Solution devices shall operate at 12V DC. Co ntroller power and communications shall be via a common communic ations bus.

(b) Central DVM S Controls Solution devices shall communicate via a c ommon central layer communications bus.

C. Wiring:

1. Main system control wiring (COM1, F1/F2) shall be installed in a system daisy chain configuration from the indoor equipment to MAIN outdoor uni t. This cable shall be 16 AWG X 2, shielded cable.

2. Zone control wiring (COM2, F3/F4) to wired remote controllers (MWR-**** *N) shall be run from the indoor unit terminal block to the controller ass ociated with that unit. This cable shall be 16 AWG X 2, shielded cable.

3. Control wiring for system controllers and centralized controllers (upper lev el) shall be installed in a daisy chain configuration from main condensin g unit to main condensing unit (R1/R2), to system controllers.

4. Communication wire connection (OF1/OF2) between main outdoor unit m odules (systems with 2 or more modules) must be connected from the MAIN unit to SUB1 and SUB2 (where applicable). This wire shall be 2-conductor, 16 AWG X 2, shielded cable.

5. MST-P3P (S-NET 3 software) shall be capable of being networked with up to 16: MIM-D00AN (DMS2), MIM-D01AUN (DMS2.5), MIM-B17N (BA Cnet gateway 2.0), MIM-B17BUN (BACnet gateway 2.5), MIM-B18 (Lon

Works gateway2.0), and/or MIM-B18BUN (Lon Works gateway 2.5) syste m controllers for web/LAN based control for consolidated control.

D. Wiring type:

1. COM1 and COM2 control wiring shall be 2-conductor, 16 AWG X 2, shie lded cable.

2. Network wiring shall be CAT-5e with RJ-45 connection.

5.2 DVM CONTROL NETWORK SOLUTION

A. General:

The SAMSUNG DVM S NASA Control Network Solution consists of remote controllers, system controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The SAMSUNG DVM S NASA Control Network Solution shall support operation monitoring, scheduling, error monitor, power distribution, personal browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces.

5.3 MULTI-FUNCTION CONTROLLER – ADVANCED WIRED CONTROLLER (MWR-WG00UN)

A. Compatibility:

1. DVM S systems (AM**********AA, MCM-D211UN), DVM Chiller FCU kits (MCM-F00N), 2020 RAC single zone high-wall units (AR**TSF*BWKN CV, RNS***BT), CAC indoor units (AC0***N****/AA) and FJM indoor uni ts (AJ0**TN*DCH/AA, JNH***DT).

B. Connection:

1. The wired controller shall control up to 16 SAMSUNG indoor units (de fined and controlled as one group).

C. Dimensions:

1. The wired controller shall be approximately 4 3/4” x 4 3/4” in size and white in color

D. The wired controller shall control SAMSUNG indoor units as follows:

1. Air handler operation ON/OFF
2. Air handler operation mode, set temperature, air flow direction, fan spe ed, individual louver control (with supported indoor units).
3. Discharge air temperature (with supported indoor units)
4. Dual Set Temperature (with supported indoor units)
5. Setback function
6. Quiet and sleep modes
7. Error display (up to 10 error codes with descriptions)
8. Filter replacement alarm display and reset
9. Single indoor unit control or multiple unit control (maximum 16 units)
10. Energy saving operation:
    (a) Upper/lower temperature setting
    (b) Automatic operation stop function
    (c) Energy saving operation mode
    (d) Energy consumption monitoring
11. Weekly operating schedule setting:
    (a) Weekly and yearly operating schedule
    (b) Options to set: desired A/C operation mode, setting temperatur e, power mode (ON/OFF), and fan speed to operate based on weekly or daily schedules
    (c) Optional schedule exception day setting
12. Advanced HP auto changeover control and configuration
13. Supports multiple languages
14. Error code display with description (ten most recent error codes)

E. Other wired controller features:

1. Different button permission levels
2. Partial button lock option (on/off, temperature setting, fan speed, all m odes, auto mode, cool mode, heat mode, dry mode, fan mode, and schedule setting buttons can be locked individually)
3. Backlight with option to dim the display after a specified time
4. Daylight savings clock advance option
5. Upper and lower temperature setting restriction
6. Heat mode skip (cooling only)
7. Restrict wireless controller signal (optional)
8. Real-time clock function - current time/day display function
9. Built in IR receiver for indoor unit control using a wireless controller a nd integral room temperature sensor.
10. Indoor unit operation state display
11. Indoor unit service mode support
12. Micro SD card slot for simple firmware updating
13. Individual louver/blade control for 4-way and mini 4-way cassettes.
14. Individual air direction control for 360 Cassette indoor units.
15. Quiet Mode setting (for supported units)
16. Service mode for connected indoor unit operation monitoring, addressi ng, and setup
17. Built-in room temperature sensor
18. Indoor unit operation state display
19. Service mode support (Indoor unit addressing, indoor unit cycle data monitoring, option code monitoring and setting, and option setting/moni toring).
20. Time synchronization with central control gateways provided by the V RF manufacturer.

21. WindFree™ display and control for supported indoor unit models.

22. Motion Detection Sensor Control (On/Off, Indirect/Direct) for supported indoor unit models. Indirect/Direct control only applies to supported u nits that have MCR-SMC and MCR-SMD installed.

23. Clean and Long reach function for supported indoor unit models.

24. Automatic air volume enable and status viewing (for Duct S models AM0**MNMDCH/AA, AM0**MNHDCH/AA, and AM0**RNMDCH/AA).

25. Maximum current control for DVM S 3Ø outdoor systems

F. Specifications:

1. Two (2) conductor connection, PLC, (F3/F4).

2. DC 12V (power supplied by indoor unit via F3/F4 connection).

3. RS485 communication (F3/F4).

4. Can sense temperature via internal sensor, temperature sensor inside t he air handler, or use the average temperature between controller and air handler temperature sensors.

5. The wired controller shall have two screw terminals for wiring connecti ons. Wire is not included with controller.

6. 16AWG X 2 shielded cable is necessary for proper operation.

7. The wired controller shall allow up to 328 feet of wire from the farthes t connected indoor unit to the controller.

Multi-Function Controller			
Item	***Description***	***Operation***	***Display***
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Auto/Cool/Dry/ Fan/Heat	Each Group	Each Group

Multi-Function Controller			
Item	***Description***	***Operation***	***Display***
Temperature Setting	1. Sets temperature for a single group. 2. Range of temperature setting (may vary depending on connected indoor unit) a. Auto/Cool/Dry: 65°F-86°F b. Heat: 47°F-86°F 3. Setting discharge outlet air temperature for supported indoor units.	Each Group	Each Group
Discharge Air Temperature Setting	Sets temperature for supported ducted units	Each Group	Each Group
Fan Speed Setting	1. Models with 3 air flow speed settings: High /Mid/Low/Auto 2. WindFree™ mode enable/disable 3. Motion Detection Sensor Control 4. Clean and Long reach function for supp orted indoor unit models.	Each Group	Each Group
Air Flow Direction Setting	1. Air flow 2-step direction (Swing/Stop) 2. Direct setting at a specific angle. 3. Air flow operation varies depending on t he model.	Each Group	Each Group
Scheduling	1. Weekly and yearly schedule settings (m aximum 8 yearly schedule groups) 2. Power ON/OFF, mode, temperature, an d fan speed settings can be set. 3. Configurable "Temporary Hold"/override duration for changes made when a sch edule has been programmed. 4. Maximum 49 total weekly and yearly sc hedule settings can be set. 5. Real-time clock function: current time, d ay display function	Each Group	Each Group
Setback	1. Four (4) configuration patterns can be s et (Wake, Leave, Return, Sleep). 2. Specify time, heating and cooling set te mperatures and mode.	Each Group	Each Group

Multi-Function Controller			
Item	***Description***	***Operation***	***Display***
Button lock	1. Button permission level setting (On/Off / Temperature setting / Mode button / Fa n speed) 2. Temperature limit setting 3. After power reset, the setting value is r estored 4. Various restriction capabilities	Each Group	Each Group
Specified Function	Automatic stop setting (setting time range: 0-12 hours)	Each Group	Each Group
Service Mode	1. Viewing/setting indoor unit option code 2. Viewing/setting indoor unit MAIN addres s 3. Viewing/setting indoor unit RMC addres s 4. Viewing indoor unit cycle data 5. Setting/Viewing temperature sensor com pensation of the wired remote controller (-9°F~ +9°F) 6. Viewing RPM compensation 7. Viewing/setting EEV stop step when ind oor unit is thermal-off during heating mo de 8. Viewing/setting filter reminder time interv al (1000 hours, 2000 hours) 9. Viewing/setting indoor unit temperature sensor compensation during Heating (+ 2°F or +5°F) 10. Viewing the H/W option setting 11. Viewing wired remote controller software version 12. Viewing/setting individual louver lock 13. Viewing indoor unit status 14. Power Master Reset 15. Resetting ODU (K3) 16. Automatic air volume enable and status viewing (for supported indoor units)	Each Unit	Each Unit

Multi-Function Controller			
Item	***Description***	***Operation***	***Display***
Blade	Setting individual blade positions on 4-Way Cassette (AM0**RN4DCH/AA, AC0**NN4DCH/AA, AJ0**TNNDCH/AA, JNH***NDT)	Each Unit	Each Unit
Error	When an error is currently occurring in the system, the afflicted unit and the error code are displayed	Each Group	Each Group
Permit / Prohibit Local Operation	Setting/releasing of simplified locking of remote control buttons	Each Group	N/A
Quiet Mode	Select the quiet mode to lower the fan noise level (for supported units)	Each Group	N/A
Room Temperature	Actual room temperature or set temperature can be displayed	Each Group	Each Group
Energy and Usage	1. Display instantaneous power (current p ower use), weekly usage, monthly usag e, and yearly usage, in graph format wit h year-over-year display option. a. The weekly display follows ISO 8601 standards. 2. Display weekly operating time, monthly operating time, yearly operating time, in graph format with year-over-year display option. 3. Target energy consumption and target o perating times can be specified. When energy consumption or operating time h as exceeded the target(s), an alarm pop up will appear for notification.	Each group	Each group

**Some features may not be available depending on the model of connected air handler(s).*

***The WindFree™ unit delivers an air current that is under 0.15 m/s while in WindFree™ mode. Air velocity that is below 0.15 m/s is considered "still air" as defined by ASHRAE 55-2013 (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).*

5.4 SIMPLE TOUCH WIRED CONTROLLER (MWR-SH11UN)

A. Connection:

1. The wired controller shall control up to 16 SAMSUNG indoor units (defin ed and controlled as one group).

B. Dimensions:

1. The wired controller shall be approximately 4 13/16" x 3 11/16" x 3/4" in size and white in color.

C. The wired controller shall have the following features and control capability:

1. The wired controller shall have an internal infrared receiver to allow cont rol of connected indoor units wirelessly via MWR-SH11UN (requires sepa rately purchased wireless controller).

2. The wired controller shall have a backlight

3. The wired controller shall have an internal temperature sensor.

4. The wired controller shall have the following temperature display options:

a. Set temperature

b. Room temperature

c. Relative temperature. Relative temperature means that the wired rem ote controller only displays the temperature increase or decrease (± 3) compared to the reference temperature. Reference temperature is d etermined set temperature defined by the central controller.

5. Indoor unit operation ON/OFF

6. Indoor unit operation modes, set temperature, louver position (cassette, c eiling, wall units), and fan speed settings.

7. Single indoor unit control or multiple unit control (maximum 16 units)

8. Full controller lock

9. Partial controller button lock (ON/OFF, operation mode button, temperatur e setting buttons, fan speed button, timer function, louver swing, sleep f

unction, quiet function, outing gin and lock mode button)

10. Upper and lower temperature setting restriction

11. Heat, cool, dry, fan, and auto mode skip options (skips specified mode on wired controller)

12. Restrict wireless controller signal (optional)

13. Single event timer function (ON/OFF control, 30 minutes ~ 24 hours tim er setting options)

14. System/indoor unit function and operation indication (defrost, error, restric ted controller, SPi status, filter reminder)

15. Quiet Mode setting (for supported units)

16. Service mode for connected indoor unit operation monitoring, addressing, and setup

17. Can be used to specify "Mode Master" while connected to a single indo or unit when used with heat pump systems to control system mode.

18. The wired controller shall support duct unit discharge air control heating and cooling temperature setting (done via service menu during initial set up) for supported ducted unit models.

19. Outing Mode for keeping a minimum heating (61~72°F) and cooling (77~ 86°F) temperature while you are away. The unit will also operate at the specified outing temperature, turning on when there is a 9°F differen ce from the set temperature. The unit will turn off when the indoor temp erature reaches back to the desired temperature. This process is r epeated for 12 hours, in which the outing mode is then shut off.

20. The wired controller shall allow WindFree™ functionality.

D. Specifications:

1. 2 conductor connection, PLC, (F3/F4).

2. DC 12V (power supplied by indoor unit via F3/F4 connection).

3. The wired controller shall have two screw terminals for wiring connection s. Wire is not included with controller.

4. 16AWG X 2 shielded cable is necessary for proper operation.

5. The wired controller shall allow up to 328 feet of wire from the farthest connected indoor unit to the controller.

Simple Touch Wired Controller			
Item	***Description***	***Operation***	***Display***
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Auto/Cool/Dry/ Fan/Heat	Each Group	Each Group
Temperature Setting	1. Sets temperature for a single group. 2. Range of temperature setting 3. Auto/Cool/Dry: 65°F-86°F 4. Heat: a. 47°F-86°F b. Nordic CAC Models (AC0**JXSC CH/AA): 46°F-86°F 5. Setting discharge outlet air temperature for supported indoor units.	Each Group	Each Group
Temperature Display	1. Room temperature 2. Set temperature 3. Relative temperature. Relative temp erature means that the wired remote controller only displays the tempera ture increase or decrease (± 3) com pared to the reference temperature. Reference temperature is determined set temperature defined by the cen tral controller.	Each Group	Each Group
Fan Speed Setting	Models with 3 air flow speed settings: High /Mid/Low/Auto	Each Group	Each Group
Air Flow Direction Setting	1. Air flow 2-step direction (Swing/Stop) 2. Air flow operation varies depending on t he model.	Each Group	Each Group
ON/OFF Timer	1. ON/OFF single event timer 2. Can set to turn unit ON and/or OFF bet ween 30 minutes ~ 24 hours.	Each Group	Each Group

Simple Touch Wired Controller			
Item	**Description**	**Operation**	**Display**
Button lock	1. Button permission level setting (On/Off / Temperature setting / Mode button / Fa n speed) 2. Temperature limit setting 3. After power reset, the setting value is r estored 4. Various restriction capabilities	Each Group	Each Group
Service Mode	1. Viewing/Setting indoor unit option code 2. Viewing/setting indoor unit MAIN addres s 3. Viewing/setting indoor unit RMC addres s 4. Viewing indoor unit cycle data 5. Viewing/setting indoor unit option setting s 6. Viewing/setting indoor unit temperature sensor compensation during Heating (+ 2°F or +5°F)	Each Unit	Each Unit
Error	When an error is currently occurring in the system, the afflicted unit and the error code are displayed	Each Group	Each Group
Permit / Prohibit Local Operation	Setting/releasing of simplified locking of remote control buttons	Each Group	N/A
Quiet Mode	Select the quiet mode to lower the fan noise level.	Each Group	N/A
Outing Mode	When the temperature drops below or goes above 9°F, of the desired temperature, while away, the system will automatically heat or cool accordingly.	Each Group	N/A

5.5 WIRELESS CONTROLLER (AR-EH04U)

A. Function:

1. The wireless controller shall support the following control options via soft-touch buttons: ON/OFF, set temperature, mode, fan speed, filter reminder reset, independent louver control, airflow direction, WindFree™ mode, a

nd single event timer setting.

2. The wireless controller shall have WindFree™ Cooling and Long Reach f unctions (applies to AM0**NNNDCH/AA, AM0**NN1DCH/AA, AM0**RN4D CH/AA, and AC0**RN4DCH/AA when using the WindFree™ fascia panel) .

3. The wireless controller shall support indoor unit option code setting, indo or unit addressing, and indoor unit option setting.

4. The wireless controller shall have a wide, easy to read display.

5. The wireless controller shall include a holder to secure remote to wall.

**The WindFree™ unit delivers an air current that is under 0.15 m/s while in WindFree™ mode. Air velocity that is below 0.15 m/s is considered "still air" as defined by ASHRAE 55-2013 (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).*

5.6 WIRELESS CONTROLLER FOR 360 CASSETTE INDOOR UNITS (AR-KH03U)

A. Function:

1. The wireless controller shall support the following control options via soft-touch buttons: ON/OFF, set temperature, mode, fan speed, filter reminder reset, independent air direction control, and single event timer setting.

2. The wireless controller shall have a wide, easy to read display.

3. The wireless controller shall support indoor unit option code setting, indo or unit addressing, and indoor unit option setting.

4. The wireless controller shall include a holder to secure remote to wall.

B. Dimensions:

1. Width Height X Depth: 1 13/16" X 5 3/8" X 13/16"

5.7 THERMOSTAT ADAPTER FOR 24VAC THERMOSTAT CONNECTION (MIM-A60UN)

A. Function:

1. Controls adapter that will allow control of Samsung HVAC systems sold in North America with a standard 24VAC thermostat

B. Connection:

1. One adapter per indoor unit connected to the F3-F4 communication line
2. 24VAC (requires field provided external 24VAC transformer).
3. One MIM-A60UN per 24VAC transformer
4. The thermostat adapter shall support provide functions to control status of SAMSUNG DVM S (AM****N****/AA), CAC (AC****N****/AA), FJM (AJ0**TN****/AA, JNH****T), RAC (AR**TSF*BWKNCV, RNS***BT)

C. Dimension:

1. The thermostat adapter shall be approximately (W X H X D): 5" X 5 1/8" X 1 1/2" in size.

5.8 WIRELESS SIGNAL RECEIVER FOR DUCT-TYPE INDOOR UNITS (MRK-A10N)

A. Connection:

1. The wireless signal receiver shall be capable of connection to 1 duct uni t.

B. Function:

1. The wireless signal receiver shall control: power, fan speed, set temperat ure, and timer via wireless controller (AR-EH04U).
2. The wireless signal receiver shall display operation indication and blinkin g LED indication in the event of system operation and abnormality/error.
3. The wireless signal receiver shall connect using included receiver wire (3 2.8').

C. Dimensions:

1. The wireless signal receiver shall be approximately 2.7" x 4.7" in size an d white in color with a LED display.
2. The wireless signal receiver shall be recessed mount.

5.9 EXTERNAL ROOM TEMPERATURE SENSOR (MRW-TA)

A. Connection:

1. The external remote room sensor shall connect to 1 indoor unit.

2. The external remote room sensor shall plug directly into PCB of indoor unit with supplied adapter.

B. Function:

1. The external remote room sensor shall be used to measure the exact ro om temperature.

2. The external remote room sensor shall support wire length of maximum 39 feet.

5.10 EXTERNAL CONTACT CONTROL INTERFACE MODULE (MIM-B14)

A. Function:

1. Indoor unit control/monitoring

(a) Control option to enable/disable and monitor a single indoor unit.

(b) Direct indoor unit control by external dry contact, 0 volts OPEN/CLO SE signal.

(c) Emergency control with simple contact input.

(d) Unoccupied room control with applicable indoor units.

(e) Supplemental, external heat control output with applicable indoor unit s.

(f) Indoor unit operation (thermal or operation)/error state output through relay contacts.

2. Outdoor unit control/monitoring

(a) System error monitoring (dry output).

(b) Manual nighttime quiet mode activation (for applicable systems).

B. Connection:

1. Installs inside or on the side of a single indoor unit.

2. Installs inside a MAIN outdoor unit.

3. Connection to indoor unit with included wire harnesses.

5.11 ON/OFF CONTROLLER (MCM-A202DUN)

A. Connection:

1. The On/Off Controller shall be capable of controlling up to 128 indoor un its (defined as 16 groups).

B. Dimensions:

1. The On/Off Controller shall be approximately 2.3” x 4.7” in size and whit e in color with 17 LED displays.

2. The On/Off Controller shall install recessed in wall. An NEC approved b ox shall be required for installation.

C. Function:

1. The On/Off Controller shall be capable of turning ON/OFF up to sixteen groups of indoor units (1 – 16 units per group), for a maximum of 128 i ndoor units.

2. Each of the 16 individual groups shall have ON/OFF control separate fro m other groups.

3. All of the indoor units shall be turned ON/OFF using the main ALL ON/ ALL OFF power button.

4. An LED for each group of indoor units, up to 16 groups, shall be indicat ed if there is a failure within each group by flashing.

5. An All LED shall be ON if all the indoor units controlled by MCM-A202D UN are turned ON.

6. An LED for each group of indoor units shall indicate the ON/OFF status of the group.

7. 208/230 VAC 50/60 Hz. power. Must install in an NEC approved box (fi eld provided).

ON/OFF Controller			
Item	***Description***	***Operation***	***Display***
ON/OFF	Run and stop operation for the air conditioner units	Group or Collective	Group or Collective
Operation Mode Setting	Auto/Cooling/Heating mode control using mode switch + ALLO ON/ALL OFF button	N/A	All Unit Groups LED
Error	LED flashes during failure.	N/A	Each Group
Schedule Operation	Not Available	N/A	N/A
Connection Position	Outdoor unit Communication Line (R1/R2)	N/A	N/A
Permit / Prohibit Local Operation	Wireless/wired remote control restriction	Each Group	N/A

5.12 INTEGRATED MANAGEMENT SYSTEM – DATA MANAGEMENT SERVER 2.5 (MIM-D01AUN)

A. Function:

1. Easy control and monitoring through web browser (optimized for Internet Explorer). Individual/Group control of up to 256 indoor units including S AMSUNG ERV, air handlers, DVM Chiller, and DVM Chiller FCU Kits.

2. The Data Management Server shall have basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up t o 256 indoor units), or all indoor units (collective batch operation). This basic controls for the MIM-D01AUN shall include on/off, operation mode selection (auto, cool, heat, dry, and fan), temperature setting, fan speed setting, airflow direction setting, error email notification, temperature limita tions, operation mode limitation, and online maintenance.

3. The Data Management Server shall support system error notification via email. The Data Management Server emailed errors shall include: error occurrence time, error code with description of error, effected equipment address, and current error status.

4. The Data Management Server shall support: system configuration, 1-day/daily/weekly scheduling, monitoring of operation status, online maintenance tool, operation superseding of the remote controllers, editable user defined control logic, and malfunction monitoring.

5. The Data Management Server shall allow maximum current setting control of each outdoor unit (DVM S Series AM****X*A***AA only).

6. Schedule control function through web browser. Up to 256 schedule settings, weekly and daily schedule setting, wireless/wired remote controller restriction setting. Digital Outputs can be incorporated into scheduling.

7. The Server shall allow configuration of unoccupied room settings for indoor units configured for unoccupied room control.

8. Convenient digital display allows for easy set up.

9. SD memory card slot for data storage and software updating.

10. Available programmable logic to control the system based on preset monitor points. Specify various system control point inputs (indoor units, outdoor units, DI, DO) and operators ($=$, $>$, $<$, $\leq$, $\geq$, $\neq$) to manipulate system operation (indoor units, outdoor units, DI, DO) based on the status of the specified variables.

11. Optional "weighted averaging" or "representative" setting for heat pump systems to provide optimal auto changeover while in Auto mode.

12. Web server function with remote control (with a public IP address) via internet connection. No management software required – PC-independent management through web browser.

13. 10 DI (Digital Input) ports available. Two digital input ports shall be for emergency shutdown with external contact control interface and 8 for other monitoring options (OPEN/CLOSE status). Full indoor unit control with simple contact input (Emergency/Lock). Digital inputs can be incorporated into control logics.

14. 8 DO (Digital output) terminals for monitoring and control options. 2 state output (Operation/Error) for synchronous control and monitoring. 6 general purpose outputs to control other components (on: 12VDC out; off: no voltage). Digital Outputs can be incorporated into control logics and scheduling.

15. The Data Management Server shall have an optional 2D floorplan displa y that will allow uploading building floorplan images in JPG, GIF, or PN G file formats. The Data Management Server 2D floorplan shall support placement of indoor units onto the floorplan for simplified user control a nd monitoring. Maximum one image file per zone, maximum 32 zones can be created.

B. Connection:

1. DC 12V, 3A power provided by AC/DC adapter (input 110-240VAC 50/60 Hz, provided with MIM-D01AUN).

2. LAN connection for web browser or SNET3 software connection.

3. 16 AWG X 2 shielded cable between SAMSUNG equipment and controls is necessary for proper operation.

4. Maximum number of RS485 connections to 1 MIM-D01AUN:

(a) 75 ON/OFF Controllers (MCM-A202DUN)

(b) 80 DVM S Series Systems (AM****X****2AA) connected direct (5 port s, 16 systems per port)

(c) Maximum 256 indoor units (air handler and/or SAMSUNG ERV)

5. Upper level device connections: S-NET 3, web client.

6. The Data Management Server shall provide functions to monitor and con trol status of SAMSUNG DVM S Series systems (AM****X****2AA) as st andard.

7. The Data Management Server shall support provide functions to monitor and control status of SAMSUNG DVM Plus II, Samsung DVM Plus III, Mini DVM, Free Joint Multi (MH***FXCA*A), and CAC (CH070/105/140C AV, DH105/140CAV, single zone systems) with installation of communicati on converter interface module per system (MIM-N01).

8. The Data Management Server shall support provide functions to monitor and control status of SAMSUNG CAC AC0***N**C*/AA (single zone syst ems) without installation of additional interface modules.

C. Dimensions:

1. The Data Management Server shall be approximately 9.4” x 10” x 2.6” i

n size with stainless steel front and LCD displays.

D. Control details:

VRF Data Management Server (DMS2.5)			
Item	**Description**	**Operation**	**Display**
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Auto/Cool/Dry/ /Fan/Heat	Each Group	Each Group
Temperature Setting	1. Sets the desired temperature for a singl e group. Range of temperature setting: a. Auto/Cool/Dry: 65°F - 86°F b. Heat: 47°F - 86°F 2. Set discharge air temperature for Applic able Samsung duct units that have bee n configured for discharge air temperatu re control. Range of temperature setting : a. Cool/Dry mode: 46°F - 64°F b. Heat mode: 64°F - 86°F	Each Group	Each Group
Fan Speed Setting	Models with 3 air flow speed settings: High /Mid/Low	Each Group	Each Group
Air Flow Direction Setting	1. Air flow 2-step direction (Swing/Stop) 2. Direct setting at a specific angle. 3. Air flow operation varies depending on t he model.	Each Group	Each Group
Web Server Function	1. Remote control with the public IP addre ss 2. No management software required – P C-independent management	Each Group	Each Group
Accessible level / Dynamic user security Management	1. Wireless/wired remote controller restricti on setting 2. Specify the scope of control and monito ring of individual unit on a per-user basi s. 3. 3 accessible levels: Admin/Manager/Use r	Each Group	Each Group
Error	1. When an error is currently occurring in t	Each	Each

VRF Data Management Server (DMS2.5)			
Item	***Description***	***Operation***	***Display***
	he system(s), the afflicted unit and the error code are displayed 2. Error notification via email	Group	Group
Schedule Operation	1. Up to 256 schedule settings 2. Weekly and daily schedule setting	Each Group	Each Group
Power Distribution System	1. Power distribution to 256 indoor units. 2. Remote data query in 1-day units 3. File saving in Microsoft Excel format. 4. Power distribution data storage for one year 5. MIM-B16N or MIM-B16UN required for power use measurements	Each Group	Each Group
External Contact Interface	1. Full indoor unit control with simple cont act input (Emergency/Lock) 2. State output (Operation/Error) for synchr onous control 3. 10 digital outputs (2 reserved) / 8 digita l inputs (2 reserved)	Each Channel	Each Channel
Smart Central Management	1. Control & monitoring zone edition 2. Wireless/wired remote control restriction 3. Temperature limit setting 4. Operation mode restriction	Each Group	Each Group
User editable control logic	1. User can edit control logic with arithmet ic/conditional operators and parameters. 2. Efficient energy saving realization for va rious operation conditions. 3. EHP/ERV/AHU parameters + AND/OR + Arithmetic equation Function	Each Group	Each Group
Data backup/useful history management	1. Important data is stored in SD memory card (settings, schedules, errors, operati on data, energy data, user settings, etc.) 2. Record the operation history and error history	Each Group	Each Group
Unoccupied Room Control	1. Specify unoccupied room settings for ap plicable indoor units	Each Group	-

VRF Data Management Server (DMS2.5)			
Item	**Description**	**Operation**	**Display**
Configuration	a. Mode b. Fan speed c. Set temperature		
DVM Chiller Control	1. Operation ON/OFF 2. Mode: Heat, cool, cool storage, hot wat er 3. Operation pattern: standard, rotation, effi ciency 4. Enable/disable Water Law 5. Enable/disable quiet mode 6. Forced fan mode 2. Demand/maximum current control (50~1 00% of design current)	Each Group	Each Group

5.13 INTEGRATED MANAGEMENT SYSTEM – S-NET3 SYSTEM MANAGEMENT SOFTWARE (MST-P3P)

A. Connection:

1. The integrated management software shall be capable of controlling up t o 4,096 indoor units.

B. Dimensions:

1. S-Net3 shall be system software installed by a CD USB security key.

C. Function:

1. The Integrated System Software shall enable the user to control multiple indoor units and shall provide additional functions.

2. The integrated management software shall be capable of being networke d with up to 16: MIM-D00AN (DMS2), MIM-D01AUN (DMS2.5), MIM-B1 7N (BACnet gateway 2.0), MIM-B17BUN (BACnet gateway 2.5), MIM-B1 8N (LonWorks gateway2.0), and/or MIM-B18BUN (Lon Works gateway 2. 5) system controllers for web/LAN based control for consolidated control.

3. The integrated management software shall be required if the user wants

to simultaneously control 16 X MIM-D00AN (DMS2), MIM-D01AUN (DMS 2.5), MIM-B17N (BACnet gateway 2.0), MIM-B17BUN (BACnet gateway 2.5), MIM-B18N (LonWorks gateway2.0), and/or MIM-B18BUN (Lon Work s gateway 2.5) from a single PC using a single software session.

4. The integrated management software shall support operation superseding that of the remote controllers, system configuration, daily/weekly/annual s cheduling, monitoring of operation status, error email notification, online maintenance tool and malfunction monitoring.

5. The integrated management software shall have basic operation controls which can be applied to an individual indoor unit, a group of indoor unit s (up to 4,096 indoor units), or all indoor units (collective batch operatio n). This basic control set of operation controls for the integrated manag ement software shall include on/off, operation mode selection (cool, heat, auto, dry and fan), temperature setting, fan speed setting, airflow directi on setting, energy distribution reporting with PDF export, and online mai ntenance.

6. The integrated management software provides centralized control, it shall be able to enable or disable operation of local remote controllers via PC .

7. The integrated management software shall also include a high-level secu rity USB key.

8. In terms of scheduling, the integrated management software shall allow t he user to define daily, weekly, and annual schedules with operations co nsisting of ON/OFF, mode selection, temperature setting, and permit/prohi bit of remote controllers.

VRF Integrated Management Software (S-Net3)			
Item	***Description***	***Operation***	***Display***
ON/OFF	Run and stop operation for a single group/unit	Each Group	Each Group
Operation Mode	Switches between Auto/Cool/Dry/Fan/Heat	Each Group	Each Group
Temperature Setting	1. Sets the desired temperature for a singl e group. Range of temperature setting: a. Auto/Cool/Dry: 65°F - 86°F b. Heat: 47°F - 86°F 2. Set discharge air temperature for Applic	Each Group	Each Group

VRF Integrated Management Software (S-Net3)			
Item	***Description***	***Operation***	***Display***
	able Samsung duct units that have bee n configured for discharge air temperatu re control. Range of temperature setting : a. Cool/Dry mode: 46°F - 64°F b. Heat mode: 64°F - 86°F		
Fan Speed Setting	Models with 3 air flow speed settings: High /Mid/Low	Each Group	Each Group
Air Flow Direction Setting	1. Air flow 2-step direction (Swing/Stop) 2. Direct setting at a specific angle. 3. Air flow operation varies depending on t he model	Each Group	Each Group
Accessible level / Dynamic user security Management	1. Wireless/wired remote controller restricti on setting 2. Specify the scope of control and monito ring of individual unit on a per-user basi s. 3. 3 accessible levels: Admin/Manager/Use r	Each Group	Each Group
Error	When an error is currently occurring on the system(s), the afflicted unit and the error code are displayed	Each Group	Each Group
Schedule Operation	1. Graphical schedule settings 2. Weekly, Daily schedule control 3. Exception date setting	Each Group	Each Group
Power Distribution System	1. Power distribution to 4,096 indoor units. 2. Remote data query in 1-day increments 3. File saving in Microsoft Excel format. 4. Power distribution data storage for one year in 1-day units. 5. MIM-B16N or MIM-B16UN required for power distribution. 6. PDF report generation with electrical op erational costs.	Each Group	Each Group

VRF Integrated Management Software (S-Net3)			
Item	***Description***	***Operation***	***Display***
Smart Central Management	1. Control & monitoring zone edition 2. Wireless/wired remote control restriction 3. Temperature limit setting 4. Operation mode restriction	Each Group	Each Group

5.14 LonWorks® GATEWAY 2.5 (MIM-B18BUN)

A. Function:

1. Easy control and monitoring through web browser (optimized for Internet Explorer) and LonWorks® TP/FT-10A (free topology 78kbs). Easy contro l and monitoring through web browser (optimized for Internet Explorer). Individual/Group control of up to 128 indoor units including SAMSUNG E RV, air handlers, DVM Chiller, and DVM Chiller FCU Kits. (indoor quant ity will vary based on number of control points necessary, see table belo w).

Control and Monitoring Items*	***Maximum Number of Connectable Indoor Units***
27 Items (all)	22
20 Items	30
15 Items	40
12 Items	50
9 Items	64
6 Items	100
4 Items	128

*20 items can be processed per second; data inquiry interval is 30 seconds.

2. The LonWorks® shall have basic operation controls which can be applie d to an individual indoor unit, a group of indoor units (up to 128 indoor units), or all indoor units (collective batch operation). This basic control set of operation controls for the LonWorks® gateway shall include on/off, operation mode selection (auto, cool, heat, dry, and fan), temperature s etting, fan speed setting, airflow direction setting, error email notification, temperature limitations, operation mode limitation, and online maintenanc

e.

3. The LonWorks® gateway shall support system error notification via email. The Data Management Server emailed errors shall include: error occur rence time, error code with description of error, effected equipment addre ss, and current error status.

4. The LonWorks® gateway shall support: system configuration, 1-day/daily/ weekly scheduling, monitoring of operation status, online maintenance to ol, operation superseding of the remote controllers, editable user defined control logic, and malfunction monitoring.

5. The LonWorks® gateway shall allow maximum current setting control of each outdoor unit (DVM S Series AM****X*A***AA only).

6. Schedule Control Function through web browser. Up to 256 schedule set tings, weekly and daily schedule setting, wireless/wired remote controller restriction setting. Digital Outputs can be incorporated into scheduling.

7. The Server shall allow configuration of unoccupied room settings for indo or units configured for unoccupied room control.

8. Convenient digital display allows for easy set up.

9. Available programmable logic to control the system based on preset mon itor points. Specify various system control point inputs (indoor units, outd oor units, DI, DO) and operators (=, >, <, ≤, ≥, ≠) to manipulate syste m operation (indoor units, outdoor units, DI, DO) based on the status of the specified variables.

10. Optional "weighted averaging" or "representative" setting for heat pump systems to provide optimal auto changeover while in Auto mode.

11. Web Server Function with remote control (with a public IP address) via i nternet connection. No management software required – PC-independen t management through web browser.

12. 10 DI (Digital Input) ports available. Two digital input ports shall be for emergency shutdown with external contact control interface and 8 for oth er monitoring options (OPEN/CLOSE status). Full indoor unit control wit h simple contact input (Emergency/Lock). Digital inputs can be incorpor ated into control logics.

13. 8 DO (Digital Output) terminals for monitoring and control options. 2 stat

e output (Operation/Error) for synchronous control and monitoring. 6 ge neral purpose outputs to control other components (on: 12VDC out; off: no voltage). Digital Outputs can be incorporated into control logics and scheduling.

14. The Data Management Server shall have an optional 2D floorplan displa y that will allow uploading building floorplan images in JPG, GIF, or PN G file formats. The Data Management Server 2D floorplan shall support placement of indoor units onto the floorplan for simplified user control a nd monitoring. Maximum one image file per zone, maximum 32 zones can be created.

B. Connection:

1. DC 12V, 3A power provided by AC/DC adapter (input 110-240VAC 50/60 Hz, provided with the LonWorks® gateway)
2. LAN connection for BMS, web browser, SNET3 software connection
3. Communication connection: ON/OFF Controller(s) (MCM-A202DUN)
4. 16 AWG X 2 shielded cable between SAMSUNG equipment and controls is necessary for proper operation
5. Maximum number of RS485 connections to 1 LonWorks® gateway:
   (a) 75 ON/OFF Controllers (MCM-A202DUN)
   (b) 80 DVM S Series Systems (AM****X****2AA) connected direct (5 port s, 16 systems per port)
   (c) Maximum 128 indoor units (air handler and/or SAMSUNG ERV)
6. Upper level device connections: S-NET 3, BMS system (LonWorks®), w eb client
7. The LonWorks® gateway shall support LonWorks® TP/FT-10A (free topol ogy 78kbs) and provide functions to monitor and control status of SAMS UNG DVM S Series systems (AM****X*****AA).
8. The Data Management Server shall support provide functions to monitor and control status of SAMSUNG DVM Plus II, Samsung DVM Plus III, Mini DVM, Free Joint Multi (MH***FXCA*A), and CAC (CH070/105/140C AV, DH105/140CAV, single zone systems) with installation of communicati

on converter interface module per system (MIM-N01).

9. The Data Management Server shall support provide functions to monitor and control status of SAMSUNG CAC AC0***N**C*/AA (single zone syst ems) without installation of additional interface modules.

C. Dimensions:

1. The LonWorks® gateway shall be approximately 9.4" x 10" x 2.6" in size with stainless steel front and LCD displays.

D. Control details:

VRF LonWorks® Gateway 2.5			
Item	***Description***	***Operation***	***Display***
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Auto/Cool/Dry/ /Fan/Heat	Each Group	Each Group
Temperature Setting	1. Sets the desired temperature for a singl e group. Range of temperature setting: a. Auto/Cool/Dry: 65°F - 86°F b. Heat: 47°F - 86°F 2. Set discharge air temperature for Applic able Samsung duct units that have bee n configured for discharge air temperatu re control. Range of temperature setting : a. Cool/Dry mode: 46°F - 64°F b. Heat mode: 64°F - 86°F	Each Group	Each Group
Fan Speed Setting	Models with 3 air flow speed settings: High /Mid/Low	Each Group	Each Group
Air Flow Direction Setting	1. Air flow 2-step direction (Swing/Stop) 2. Direct setting at a specific angle. 3. Air flow operation varies depending on t he model.	Each Group	Each Group
Web Server Function	1. Remote control with the public IP addre ss 2. No management software required – P C-independent management	Each Group	Each Group

VRF LonWorks® Gateway 2.5			
Item	***Description***	***Operation***	***Display***
Accessible level / Dynamic user security Management	1. Wireless/wired remote controller restricti on setting 2. Specify the scope of control and monito ring of individual unit on a per-user basi s. 3. 3 accessible levels: Admin/Manager/Use r	Each Group	Each Group
Error	1. When an error is currently occurring on the System(s), the afflicted unit and the error code are displayed 2. Error notification via email	Each Group	Each Group
Schedule Operation	1. Up to 256 schedule settings 2. Weekly and daily schedule setting	Each Group	Each Group
Power Distribution System	1. Power distribution to 128 indoor units. 2. Remote data query in 1-day units 3. File saving in Microsoft Excel format. 4. Power distribution data storage for one year 5. MIM-B16 or MIM-B16N required for pow er use measurements	Each Group	Each Group
External Contact Interface	1. Full indoor unit control with simple cont act input (Emergency/Lock) 2. State output (Operation/Error) for synchr onous control 3. 10 digital outputs (2 reserved) / 8 digita l inputs (2 reserved)	Each Channel	Each Channel
Smart Central Management	1. Control & monitoring zone edition 2. Wireless/wired remote control restriction 3. Temperature limit setting 4. Operation mode restriction	Each Group	Each Group
User editable control logic	1. User can edit control logic with arithmet ic/conditional operators and parameters. 2. Efficient energy saving realization for va rious operation conditions. 3. EHP/ERV/AHU parameters + AND/OR + Arithmetic equation Function	Each Group	Each Group

VRF LonWorks® Gateway 2.5			
Item	***Description***	***Operation***	***Display***
Data backup/ useful history management	1. Important data is stored in SD memory card 2. Record the operation history and error history	Each Group	Each Group
Unoccupied Room Control Configuration	1. Specify unoccupied room settings for ap plicable indoor units a. Mode b. Fan speed c. Set temperature	Each Group	-
DVM Chiller Control	1. Operation ON/OFF 2. Mode: Heat, cool, cool storage, hot wat er 3. Operation pattern: standard, rotation, effi ciency 4. Enable/disable Water Law 5. Enable/disable quiet mode 6. Forced fan mode 2. Demand/maximum current control (50~1 00% of design current)	Each Group	Each Group

VRF LonWorks® Gateway 2.5		
Input Variables (Control)	***Output Variables (Monitor)***	
On/Off control	On/Off state	In/out contact state
Operation mode	Operation mode	Emergency Stop
Temperature setting	Set/Room temperature	Error code
Fan speed/direction	Fan speed/direction	Indoor time duration
ERV operation mode	ERV operation mode	
ERV fan speed	ERV fan speed	
Filter alarm reset	Filter alarm	
User control restriction	User control restriction	
Operation mode lock	Thermal Off/On	
Set temperature limit	Power distribution	
Emergency stop	Operation mode lock	

VRF LonWorks® Gateway 2.5		
Input Variables (Control)	***Output Variables (Monitor)***	
Output contact control	Set temperature limit	

5.15 BACnet® GATEWAY 2.5 (MIM-B17BUN)

A. Function:

1. Easy control and monitoring through web browser (optimized for Internet Explorer). Individual/Group control of up to 256 indoor units including S AMSUNG ERV, air handlers, DVM Chiller, and DVM Chiller FCU Kits.

2. The BACnet® gateway shall have basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 256 i ndoor units), or all indoor units (collective batch operation). This basic c ontrol set of operation controls for the BACnet® gateway shall include o n/off, operation mode selection (auto, cool, heat, dry, and fan), temperatu re setting, fan speed setting, airflow direction setting, error email notificat ion, temperature limitations, operation mode limitation, and online mainte nance.

3. The BACnet® gateway shall support system error notification via email. The Data Management Server emailed errors shall include: error occurre nce time, error code with description of error, effected equipment addres s, and current error status.

4. The BACnet® gateway shall support: system configuration, 1-day/daily/we ekly scheduling, monitoring of operation status, online maintenance tool, operation superseding of the remote controllers, editable user defined co ntrol logic, and malfunction monitoring.

5. The BACnet® gateway shall allow maximum current setting control of ea ch outdoor unit (DVM S Series AM****X*****AA only).

6. Schedule Control Function through web browser. Up to 256 schedule set tings, weekly and daily schedule setting, wireless/wired remote controller restriction setting. Digital Outputs can be incorporated into scheduling.

7. The Server shall allow configuration of unoccupied room settings for indo

or units configured for unoccupied room control.

8. Convenient digital display allows for easy set up.

9. SD memory card slot for data storage and software updating.

10. Available programmable logic to control the system based on preset mo nitor points. Specify various system control point inputs (indoor units, out door units, DI, DO) and operators (=, >, <, ≤, ≥, ≠) to manipulate syste m operation (indoor units, outdoor units, DI, DO) based on the status of the specified variables.

11. Optional "weighted averaging" or "representative" setting for heat pump systems to provide optimal auto changeover while in Auto mode.

12. Web Server Function with remote control (with a public IP address) via i nternet connection. No management software required – PC-independen t management through web browser.

13. 10 DI (Digital Input) ports available. Two digital input ports shall be for emergency shutdown with external contact control interface and 8 for oth er monitoring options (OPEN/CLOSE status). Full indoor unit control with simple contact input (Emergency/Lock). Digital inputs can be incorporate d into control logics.

14. 8 DO (Digital Output) terminals for monitoring and control options. 2 stat e output (Operation/Error) for synchronous control and monitoring. 6 ge neral purpose outputs to control other components (on: 12VDC out; off: no voltage). Digital Outputs can be incorporated into control logics and scheduling.

15. The Data Management Server shall have an optional 2D floorplan displa y that will allow uploading building floorplan images in JPG, GIF, or PN G file formats. The Data Management Server 2D floorplan shall support placement of indoor units onto the floorplan for simplified user control a nd monitoring. Maximum one image file per zone, maximum 32 zones can be created.

B. Connection:

1. DC 12V, 3A power provided by AC/DC adapter (input 110-240VAC 50/60 Hz, provided with the BACnet® gateway)

2. LAN connection for BMS, web browser, SNET3 software connection

3. Communication connection: ON/OFF Controller(s) (MCM-A202DUN)

4. 16 AWG X 2 shielded cable between SAMSUNG equipment and controls is necessary for proper operation

5. Maximum number of RS485 connections to 1 BACnet® gateway:

   (a) 75 ON/OFF Controllers (MCM-A202DUN)

   (b) 80 DVM S Series Systems (AM****X****2AA) connected direct (5 port s, 16 systems per port)

   (c) Maximum 128 indoor units (air handler and/or SAMSUNG ERV)

6. Upper level device connections: S-NET 3, BMS system (BACnet® IP), web client

7. MIM-B17BUN shall provide functions to monitor and control status of SA MSUNG DVM S Series systems (AM****X****2AA).

8. The Data Management Server shall support provide functions to monitor and control status of SAMSUNG DVM Plus II, Samsung DVM Plus III, Mini DVM, Free Joint Multi (MH***FXCA*A), and CAC (CH070/105/140C AV, DH105/140CAV, single zone systems) with installation of communicati on converter interface module per system (MIM-N01).

9. The Data Management Server shall support provide functions to monitor and control status of SAMSUNG CAC AC0***N**C*/AA (single zone syst ems) without installation of additional interface modules.

C. Dimensions:

1. The BACnet® gateway shall be approximately 9.4" x 10" x 2.6" in size with stainless steel front and LCD displays.

D. Control details:

VRF BACnet® Gateway 2.5			
Item	***Description***	***Operation***	***Display***
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Auto/Cool/Dry/ /Fan/Heat	Each Group	Each Group

VRF BACnet® Gateway 2.5			
Item	**Description**	**Operation**	**Display**
Temperature Setting	1. Sets the temperature for a single group. Range of temperature setting a. Auto/Cool/Dry: 65°F-86°F b. Heat: 47°F-86°F 2. Set discharge air temperature for Applic able Samsung duct units that have bee n configured for discharge air temperatu re control. Range of temperature setting : a. Cool/Dry mode: 46°F - 64°F b. Heat mode: 64°F - 86°F	Each Group	Each Group
Fan Speed Setting	Models with 3 air flow speed settings: High /Mid/Low	Each Group	Each Group
Air Flow Direction Setting	1. Air flow 2-step direction (Swing/Stop) 2. Direct setting at a specific angle. 3. Air flow operation varies depending on t he model.	Each Group	Each Group
Web Server Function	1. Remote control with the public IP addre ss 2. No management software required – P C-independent management	Each Group	Each Group
Accessible level / Dynamic user security Management	1. Wireless/wired remote controller restricti on setting 2. Specify the scope of control and monito ring unit on a per-user 3. 3 accessible levels: Admin/Manager/Use r	Each Group	Each Group
Error	1. When an error is currently occurring in t he system(s), the afflicted unit and the error code are displayed 2. Error notification via email	Each Group	Each Group
Schedule Operation	1. Up to 256 schedule settings 2. Weekly and daily schedule setting	Each Group	Each Group

VRF BACnet® Gateway 2.5			
Item	***Description***	***Operation***	***Display***
Power Distribution System	1. Power distribution to 256 indoor units. 2. Remote data query in 1-day units 3. File saving in Microsoft Excel format. 4. Power distribution data storage for one year 5. MIM-B16N or MIM-B16UN required for power use measurements	Each Group	Each Group
External Contact Interface	1. Full indoor unit control with simple cont act input (Emergency/Lock) 2. State output (Operation/Error) for synchr onous control 3. 10 digital outputs (2 reserved) / 8 digita l inputs (2 reserved)	Each Channel	Each Channel
Smart Central Management	1. Control & monitoring zone edition 2. Wireless/wired remote control restriction 3. Temperature limit setting 4. Operation mode restriction	Each Group	Each Group
User editable control logic	1. User can edit control logic with arithmet ic/conditional operators and parameters. 2. Efficient energy saving realization for va rious operation conditions. 3. EHP/ERV/AHU parameters + AND/OR + Arithmetic equation Function	Each Group	Each Group
Data backup/useful history management	1. Important data is stored in SD memory card (settings, schedules, errors, operati on data, energy data, user settings, etc.) 2. Record the operation history and error history	Each Group	Each Group
Unoccupied Room Control Configuration	1. Specify unoccupied room settings for ap plicable indoor units a. Mode b. Fan speed c. Set temperature	Each Group	-
DVM Chiller Control	1. Operation ON/OFF 2. Mode: Heat, cool, cool storage, hot wat	Each Group	Each Group

VRF BACnet® Gateway 2.5			
Item	***Description***	***Operation***	***Display***
	er 3. Operation pattern: standard, rotation, effi ciency 4. Enable/disable Water Law 5. Enable/disable quiet mode 6. Forced fan mode 7. Demand/maximum current control (50~1 00% of design current)		

VRF BACnet® Gateway 2.5		
Input Variables (Control)	***Output Variables (Monitor)***	
On/Off control	On/Off state	In/out contact state
Operation mode	Operation mode	Emergency Stop
Temperature setting	Set/Room temperature	Error code
Fan speed/direction	Fan speed/direction	Indoor unit run time
ERV operation mode	ERV operation mode	DO/DI Status
ERV fan speed	ERV fan speed	SPI setting
Filter alarm reset	Filter alarm	DVM Chiller Chilled water temperature
User control restriction	User control restriction	Error status
Operation mode lock	Thermal Off/On	
Set temperature limit	Power distribution	
Emergency stop	Operation mode lock	
Output contact control	Set temperature limit	
DO ON/OFF	Human Sensor (select units)	
Duct unit discharge air temperature set temperature (select units)	Duct unit discharge air temperature (select units)	
DVM Chiller Chilled water temperature	DVM Chiller demand limit setting	
DVM Chiller set temperature	Operation hours	
DVM Chiller demand limit	DVM Chiller Water Law	

VRF BACnet® Gateway 2.5		
Input Variables (Control)	***Output Variables (Monitor)***	
setting		
DVM Chiller Water Law	DVM Chiller set temperature	
DVM Chiller quiet mode	DVM Chiller quiet mode	

5.16 CENTRAL TOUCHSCREEN SYSTEM CONTROLLER (MCM-A300UN)

A. Function:

1. The central touchscreen controller is only compatible with Samsung DVM S, CAC single zone, and Free Joint Multi (with MIM-N01 adapter) syste ms.

2. The central touchscreen controller shall provide control and monitoring vi a 7" touchscreen interface.

3. The central touchscreen controller shall provide Individual/Group control o f up to 128 indoor units (16 systems maximum).

4. The central touchscreen controller shall allow control and monitoring of in door unit: operation mode, set temperature, room temperature, fan speed , louver position, remote control restriction, and power.

5. The central touchscreen controller shall 2 X DI (digital input) terminals to allow quick disable of equipment with a 0 volt contact

6. The central touchscreen controller shall have 1 X DO (digital output) that will provide 12V DC output interlocked with indoor unit operation (ON/O FF).

7. The central touchscreen controller shall have an SD card slot for data b ackup and future firmware updates.

8. The central touchscreen controller shall provide scheduling capability. Sc heduling shall control of indoor unit: operation mode, set temperature, fa n speed, louver position, remote control restriction, and power.

9. The central touchscreen controller shall have an all ON/OFF button

10. The central touchscreen controller shall allow creation of zones and gro uping of indoor units regardless of connected refrigerant system.

11. The central touchscreen controller shall allow grouping of multiple indoo r units to display as a single unit on user interface.

12. The central touchscreen controller shall have customizable group and z one icons on main interface to allow easy operation for user.

13. The central touchscreen controller shall allow restriction of ON/OFF, mo de, set temperature, fan speed, and remote control use for daily (non-m anagement) touchscreen controller users.

14. The central touchscreen controller shall have menu lock capability allowi ng restriction of indoor unit control, schedule setting/changing, and touch screen controller settings by daily (non-management) touchscreen controll er users.

15. The central touchscreen controller shall allow screen lock to prevent un wanted changes by unauthorized users.

16. The central touchscreen controller shall have an LED indicator light on front of device to display operation and error status.

B. Connection:

1. The central touchscreen controller shall be powered by 100~240 VAC, 5 0/60 Hz.

2. The central touchscreen controller can connect to a single DVM S syste m via 2 X 16 AWG shielded cable on main system communication termi nals (F1/F2). Connection on F1/F2 will allow control and monitoring of a single system.

3. The central touchscreen controller can connect to multiple systems via 2 X 16 AWG shielded cable on central control connections (R1/R2). Maxi mum 16 systems can be daisy chained on this communication line.

4. Multiple touchscreen controllers can be connected to a single central con trol connection (R1/R2, maximum 16) when used with MIM-D00AN, MIM-D01AUN, MIM-B17N, MIM-B17BUN, MIM-B18N, and MIM-B18BUN.

C. Dimensions:

1. The central touchscreen controller shall be 8" x 6 5/16" x 1 1/2" (WxHx D).

5.17 ELECTRICITY METER INTERFACE MODULE (MIM-B16N, MIM-B16UN)

A. Function:

1. Pulse Input Module (PIM) for SAMSUNG DVM Plus and SAMSUNG DV M S Series heat pump and heat pump/heat recovery systems

2. The electricity meter interface module shall support up to 8-channel, real-time watt-hour consumption display

3. The electricity meter interface module shall support automatic watt-hour meter tracking and current communication state indication

4. The electricity meter interface module shall communicate to the following SAMSUNG controllers/gateways: MIM-D00AN (DMS2), MIM-D01AUN (DM S2.5), MIM-B17N (BACnet gateway 2.0), MIM-B17BUN (BACnet gateway 2.5), MIM-B18 (LonWorks gateway2.0), and/or MIM-B18BUN (Lon Works gateway 2.5) to monitor/record energy consumption.

B. Connection:

1. Energy consumptions data shall be viewed via the following SAMSUNG

controllers/gateways: MIM-D00AN (DMS2), MIM-D01AUN (DMS2.5), MIM-B17N (BACnet gateway 2.0), MIM-B17BUN (BACnet gateway 2.5), MIM-B18 (LonWorks gateway2.0), and/or MIM-B18BUN (Lon Works gateway 2.5), SNET 3 Software (MST-P3P).

2. The electricity meter interface module shall support up to 8 watt-hour meters with pulse output.

3. DC 12V, 3A power provided by AC/DC adapter (input 110-240VAC 50/60 Hz, provided with electricity meter interface module)

5.18 COMMUNICATION INTERFACE MODULE (MIM-N01)

A. Function:

1. Communication device that interfaces DVM S indoor and units with DVM Plus III central control systems (MCM-A202D, MIM-D00A, MIM-B17, MIM-B18, MCM-A300UN).

2. Communication device that interfaces DVM Plus III indoor and outdoor units with DVM S central control systems (MCM-A202DUN, MIM-D00AN, MIM-D01AUN, MIM-B17N, MIM-B17BUN, MIM-B18N, MIM-B18BUN, MCM-A300UN).

3. Communication device that interfaces Samsung single zone and multi-split systems: CH***CAV, DH***CAV, AJ0**JCJ*CH/AA and MH0**FXCA*A, systems with DVM S central control systems (MCM-A202DUN, MIM-D00AN, MIM-D01AUN, MIM-B17N, MIM-B17BUN, MIM-B18N, MIM-B18BUN, MCM-A300UN).

B. Connection:

1. DC 12V

2. RS485 communication (F1/F2) to Main outdoor unit with supplied connection wire.

3. RS485 communication (R1/R2) to DVM Plus III / DVM S central control system(s).

4. Mounts in MAIN outdoor unit (single zone, wall mounted units may require installation at indoor unit with included enclosure).

5. 1 X MIM-N01 for each system (1-3 outdoor modules).

5.19 MODE SELECTOR SWITCH FOR HEAT PUMP SYSTEMS (MCM-C200U)

A. Function:

1. The mode selector switch shall connect to SAMSUNG DVM S outdoor u nit models AM****X*A***AA to easily switch operation mode of the conne cted system

2. The mode selector switch shall allow for mode change options: Cool, He at, and Auto.

B. Connection:

1. The mode selector switch shall include a connection harness that connec ts to MAIN outdoor unit PCB.

2. The mode selector switch shall install in MAIN outdoor unit as standard. The connection harness can be extended up to 328'

3. The mode selector switch shall only connect to and control one system.

5.20 MOTION DETECTOR (MCR-SMC / MCR-SMD / MCR-SME)

A. Function:

1. The motion detector (MCR-SMC) shall connect to SAMSUNG DVM S Wi ndFree™ 4-Way cassette fascia panel, PC4NUFMUN.

2. The motion detector (MCR-SMD) shall connect to SAMSUNG DVM S Wi ndFree™ Mini 4-Way cassette fascia panels, PC4SUFMUN.

3. The motion detector (MCR-SME) shall connect to SAMSUNG DVM S 36 0 cassette fascia panel, PC4NUDMUN (white "ceiling type" square panel) .

4. The motion detector can be turned ON/OFF with a wired controller.

5. The motion detector shall monitor occupancy and turn off indoor unit afte r motion is not sensed for the specified duration (30, 60, 120, and 180 minutes).

6. The motion detector shall monitor occupancy and adjust target evaporato r temperature after motion is not sensed for the specified duration (30, 6

0, 120, and 180 minutes) thus lowering capacity of unit to reduce energ y use.

B. Connection:

1. The motion detector shall install in the corner of the cassette fascia pan el.

2. The motion detector shall connect to the indoor unit PCB with provided cable.

5.21 WI-FI ADAPTER (MIM-H04UN, MIM-H05UN)

A. Function:

1. The Wi-Fi adapter shall allow remote control of Samsung DVM S indoor units (AM****N***/AA), single zone CAC systems (AC0***N****/AA), and F JM systems (AJ0**T*****/AA, AJ0**B*****/AA) from a mobile device (Andr oid or iOS) with manufacturer provided mobile app.

2. The Wi-Fi adapter can be installed on systems that also have other cent ral control devices like Central Touch Controllers and Data Management Servers.

3. The Wi-Fi adapter shall control/monitor indoor unit: power status, mode, set temperature, room temperature, fan speed, and supply air louver pos ition.

4. The Wi-Fi adapter shall provide 7 Day scheduling for a single unit or m ultiple indoor units.

5. The Wi-Fi adapter shall provide basic daily, weekly, and monthly energy consumption checking (energy consumption data is for general reference only and should not be used for billing purposes. Data provided will not necessarily match your utility bill).

6. The Wi-Fi adapter shall allow group configuration option for simple contr ol of multiple units at the same time.

7. Requires a local Wi-Fi router with DHCP enabled and an internet connec tion.

8. The Wi-Fi adapter shall be capable of Geo-fencing.

9. The Wi-Fi adapter will allow automation through logic control.

10. The Wi-Fi adapter has firmware update capability through Micro SD car d.

B. Connection:

1. The Wi-Fi adapter power supply shall be 12VDC provided by an indoor unit.

2. Wi-Fi communication: 802.11b, g, n (2.4 GHz and 5 GHz supported).

3. The Wi-Fi adapter will have a 4 wire connection to an indoor unit (F1/F2 , V1/V2). If controlling indoor units on multiple systems, the adapter will connect to the central control communication bus (R1/R2) from the outd oor unit and can be powered from an indoor unit (V1/V2) or from a field provided 12VDC power supply.

4. One Wi-Fi adapter shall provide monitoring and control of up to 16 indo or units on up to 16 systems.

5. Up to 16 Wi-Fi adapters can be connected to a single DVM S system w ith 1-16 indoor units per Wi-Fi adapter to control up to 64 indoor units.

6. Multi-tenant control is possible to allow specific users to access specific i ndoor units on a system. Up to 16 individual tenants can be configured per system. Each tenant will require an individual Wi-Fi adapter.

7. Master user can share access with other users and can remove access at any time via SmartThings mobile app.

8. Maximum of 200 accounts, Wi-Fi adaptor quantity per account: 200 units.

5.22 MULTI-TENANT FUNCTION CONTROLLER (MCM-C210N)

A. Function:

The MCM-C210N Multi-Tenant Function Controller (MTFC) installs in a single indoor unit and monitors supply voltage to an indoor unit and provides power to that unit's PCB when supply voltage is removed to prevent full system shutdown due to an indoor unit being offline for prolonged periods.

1. When supply voltage to an indoor unit is removed/off, MCM-C210N will p rovide auxiliary 12V DC and 5V DC power to the indoor unit PCB to ke ep it "awake". When supply voltage to an indoor unit is supplied norma lly, MCM-C210N will cut auxiliary power to the indoor unit PCB allowing normal operation.

2. Operating temperature range: 14°F - 122°F (-10°C - 50°C)

3. Maximum indoor unit connection: one (1)

4. MCM-C210N must be installed in an NEC approved enclosure (field provided)

B. Dimensions:

1. 4 7/16" X 2 15/16"

C. Electrical:

1. Power supply: 24 VAC, 50/60 Hz, provided by external transformer (field provided).

2. Power consumption: 10W

3. 5V DC indoor unit connection cable with plug length: 118"

4. 12VDC indoor unit connection shall use field provided control wire between the MCM-C210N and the indoor unit PCB.

5. Transformer specifications: UL Standard, Class 2, 24 VAC ± 15%, 50/60 Hz

6. 24 VAC transformer supply voltage must be supplied from a different circuit than indoor units with MTFC.

5.23 Intesis™ BACnet IP-MSTP INTERFACES FOR MULTIPLE INDOOR UNITS (INBACSAMO***000)

A. General:

1. The interface adapter will allow bidirectional control and monitoring of Samsung NASA systems from a BMS, SCADA, PLC, or any other device working as a BACnet IP Server or a BACnet MSTP Master.

2. The interface adapter shall be UL and BTL certified.

3. The interface adapter shall be able to scan for automatic identification of units connected to the VRF system.

4. The interface adapter shall support both BACnet/IP and BACnet MSTP physical layers.

5. The interface adapter shall be able to datalog through external USB port.

6. The interface adapter shall allow configuration through IP or USB (console) port.

7. The front of the interface adapter shall have LED indicators to provide easy to check communication status on both the Ethernet and serial ports.

8. The interface adapter shall allow automatic updates for both Intesis MAPS and the interface firmware.

9. The interface adapter shall allow connection of multiple DVM S indoor units.

Model Number	***Indoor Unit Quantity***
INBACSAM004O000	1 to 4
INBACSAM008O000	1 to 8
INBACSAM016O000	1 to 16
INBACSAM064O000	1 to 64

B. Compatibility

1. The interface adapter shall provide functions to control and monitor SAMSUNG DVM S (AM*********/AA), CAC (AC*********/AA), RAC 2.0 (AR**T*******CV, AR**B*******CV), FJM (AJ0**T*****/AA, AJ0**B*****/AA), DVM Chiller (AG0**

KSVA*H/AA) systems.

C. Connection:

1. Power supply recommended spec is 24 VDC~>=140mA. Supports 9 to 30 VDC140mA or 24 VAC 127mA.

D. Dimension:

1. The interface adapter shall be approximately (W X H X D): 3 1/2” X 2 1/4” X 3 1/2" in size.

E. Control Details

BACnet Points								
Control Point	Central Control	DVM Chiller		ERV		Gateway	Indoor Unit	
	Output	Input	Output	Input	Output	Input	Input	Output
Buzzer Sound								×
Communication Error Outdoor Unit						×		
Communication Status		×		×			×	
Controller Restriction		×	×	×	×		×	×
Discharge Current Temperature							×	
Discharge Setpoint Cooling							×	×
Discharge Setpoint Heating							×	×
Error Sub (Chiller)		×						
Fan Speed							×	×
Fan Speed (all units)	×							
Filter Reset					×			×
Filter Sign				×			×	
Hot Water On/Off (all units)	×							
Mode (all units)	×							
Mode (Chiller)		×	×					
Mode (Indoor Unit/AHU)							×	×
On/Off		×	×				×	×
On/Off (all units)	×							
Outdoor Unit Addressing Error						×		
Room Temperature							×	
Setpoint							×	×
Sub Chiller in Error		×						

BACnet Points								
Control Point	***Central Control***	***DVM Chiller***		***ERV***		***Gateway***	***Indoor Unit***	
	Output	***Input***	***Output***	***Input***	***Output***	***Input***	***Input***	***Output***
Temperature Setpoint (all units)	×							
Unit Error code		×		×			×	
Unit type		×		×			×	
Vane Position Swing							×	×
Vane Position Swing (all units)	×							
Ventilation Fan Speed				×	×			
Ventilation Mode				×	×			
Ventilation On/Off				×	×			
Ventilation On/Off (all units)	×							
Water Out Average Temperature		×						
Water Out Setpoint (Chiller)		×	×					

5.24 Intesis™ BACnet MSTP INTERFACE FOR 1 INDOOR UNIT (INBACSAM001R100)

A. General:

1. The interface adapter will allow bidirectional control and monitoring of Samsung NASA systems from a BMS, SCADA, PLC, or any other device working as a BACnet MSTP Master.

2. The interface shall support BACnet MSTP physical layer

3. The interface adapter shall be BTL certified.

4. The interface adapter shall allow control and monitoring of the AC unit fr om BACnet, including AC unit's power, mode, room temperature, set tem perature, fan speed, air direction, filter reminder, WindFree™* mode, 360 Cassette airflow, error code status, lock remote control, on time counter , occupied cool/heat set points, unoccupied cool/heat set points, occupan cy, serial number, and other points.

5. The interface adapter shall allow monitoring of errors, alarms, and various internal variables.

6. The interface adapter shall allow installation either simply from the adapter

(wiring and DIP-switch settings) without the need of software.

7. The interface adapter shall allow simultaneous control of indoor units by wired/wireless controllers and BACnet MSTP.

8. The interface adapter shall allow mounting on DIN rail, wall, or inside the indoor unit (varies by model).

B. Compatibility:

1. The interface adapter shall provide functions to control and monitor SAM SUNG NASA VRF system indoor units, DVM S (AM****N****/AA), CAC (AC****N****/AA), RAC 2.0 (AR**T******NCV, AR**B******NCV), and FJM 2 .0 (AJ0**TN****/AA, AJ0**BN****/AA) systems.

2. RAC 2.0 Models (AR**T*****NCV, AR**B******NCV) will require a wired c ontroller sub-PCB for connection.

C. Connection:

1. The interface adapter shall operate without an external power.

2. A single interface adapter shall be required for each indoor unit.

3. The interface adapter shall connect directly to an indoor unit via the Remote Controller Bus (F3/F4 connector) and connect to BACnet MSTP EIA-485 Bus network via the 2-pole plug-in terminal block.

4. Connection of INBACSAM001R100 and one (1) Samsung wired controller is possible.

D. Dimensions:

1. The interface adapter shall be approximately (W X H X D) 2.1" X 3.5" X 2.28" in size.

5.25 Intesis™ MODBUS RTU INTERFACE (INMBSSAM001R100)

A. General:

1. The interface adapter will allow bi-directional communication between Samsung NASA indoor units and Modbus RTU (RS-485) networks.

2. The interface adapter shall allow control of the main indoor unit functions, e.g.

operating mode, fan speed, set temperature, louver position, and other points.

3. The interface adapter shall allow monitoring of errors, alarms, and various internal variables.

4. The interface adapter shall allow installation either simply from the adapter (wiring and DIP-switch settings) without the need of software setup or from the Modbus RTU.

5. The interface adapter shall allow simultaneous control of indoor units by wired/wireless controllers and Modbus RTU.

6. The interface adapter shall allow mounting on DIN rail, wall, or inside the indoor unit (varies by model).

7. The interface adapter shall allow window contact function for energy savings.

8. The interface adapter shall allow total control and monitoring of the AC unit from Modbus RTU, including AC unit's internal variables, running hours counter (for filter maintenance control) and system error codes.

B. Compatibility:

1. The interface adapter shall provide functions to control and monitor SAM SUNG NASA VRF system indoor units, DVM S (AM****N****/AA), CAC (AC****N****/AA), RAC 2.0 (AR**T******NCV, AR**B******NCV), and FJM 2 .0 (AJ0**TN****/AA, AJ0**BN****/AA) systems.

2. RAC 2.0 Models (AR**T*****NCV, AR**B******NCV) will require a wired c ontroller sub-PCB for connection.

C. Connection:

1. The interface adapter shall operate without an external power.

2. A single interface adapter shall be required for each indoor unit.

3. Up to 63 interface adapters (Modbus sub-device) shall be allowed for connected into a single network.

4. The interface adapter shall connect directly to an indoor unit via the Remote Controller Bus (F3/F4 connector) and connect to Modbus RTU RS-485 network via the 2-pole plug-in terminal block.

5. Connection of INMBSSAM001R100 and one (1) Samsung wired controller is possible.

D. Dimension:

1. The interface adapter shall be approximately (W X H X D) 3 11/16" x 2 1/8" x 2 5/16" in size.

E. Control details:

1. Control and status registers

Control and Status Registers			
Register Address (protocol address)	***Register Address (PLC address)***	***Read/ Write***	***Description***
0	1	R/W	AC unit On/Off
1	2	R/W	AC unit Mode
2	3	R/W	AC unit Fan Speed
3	4	R/W	AC unit Vane Position
4	5	R/W	AC unit Temperature setpoint
5	6	R	AC unit Temperature reference
6	7	R/W	Window Contact
7	8	R/W	INMBSSAM001R000 Disablement
8	9	R/W	AC Remote Control Disablement
9	10	R/W	AC unit Operation Time
10	11	R	AC unit Alarm Status
11	12	R	Error Code
22	23	R/W	Indoor unit ambient temperature
23	24	R	AC Real temperature setpoint
26	27	R/W	AC unit Left/Right Vane Position
66	67	R	Return path Temperature
97	98	R/W	Block Periodic Sending
98	99	R/W	Master/Slave (gateway)

Configuration Registers			
Register Address (protocol address)	***Register Address (PLC address)***	***R/W***	***Description***
13	14	R/W	"Open Window" switch-off timeout
14	15	R	Modbus RTU baud-rate
15	16	R	Modbus Slave Address
21	22	R	Max number of fan speeds
49	50	R	Device ID: 0x1200
50	51	R	Software version
67	68	R	Number of IUs connected
81	82	R	Error Address
99	100	W	Reset/Reboot device

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS

Conform with applicable provisions of the General Conditions, the Supplementary Conditions and the General Requirements.

1.02 RELATED SECTIONS

Section 15050, General Mechanical Requirements.
Section 15250, Mechanical Systems Insulation.

1.03 SCOPE

Furnish and install new energy recovery ventilators, variable refrigerant flow units, filters, sheetmetal work, acoustic lining where specified, grilles, louvers, diffusers and registers, sound traps, accessories and incidentals.

PART 2 - PRODUCTS

2.01 EQUIPMENT

All major items of equipment are specified in the equipment schedules on the drawings and shall be furnished complete with all accessories normally supplied with the catalog item listed and all other accessories necessary for a complete and satisfactory operating system. Equipment substitutions shall be acceptable only if prior approval before bidding has been applied for and only if the substituted brands are capable of providing the exact same performance, capacities and quality of construction as the specified equipment.

2.02 DUCTWORK

Materials and Gauges: Construct all ducts, casings, plenums, etc. of galvanized steel sheets of the gauges specified below, unless otherwise shown. Sheets shall be free from blisters, slivers, pits and imperfectly galvanized spots. Construct low velocity ducts using double or Pittsburgh corner seams. All seams shall be made airtight. Low velocity rectangular ductwork shall be constructed in accordance with the following schedule. Low velocity ductwork shall conform to current SMACNA minimum requirements, or the following schedule may be used as a guide:

Schedule for Rectangular Sheet Metal Duct Construction
(for reference only)

Gal.Steel U.S.Gauge	Max.Side Duct,In.	Transverse Joint Connection	Max.Length of Section
26	Up to 18"	S-slip	10'-0"
24	19" to 30"	1"standing pocket slip (gov't. lock)	5'-0"
22	31" to 40"	1-1/2" standing pocket slip (gov't. lock)	5'-0"

Flexible Ducts: Flexible ducts for connections at diffusers, or other low pressure applications, use factory insulated flexible conduit, Genflex SLR-181 or approved equal. All flexible duct shall not exceed a flame spread rating of 25 or a smoke development rating of 50. The length of flexible duct shall be limited to 5'-0" maximum.

Flexible Connections: Provide flexible connections, not less than 4" wide, constructed of heavy waterproof woven plastic coated glass fabric, at the inlet and outlet connection of each fan unit where directly connected to duct system, securely fastened to the unit and to the ductwork by a galvanized iron band, provided with tightening screws. Central station unit fan section shall be arranged with flexible connections on both sides as shown on the drawings.

2.03 ACCESS DOORS

Wall and Ceiling Access Doors: Wall and ceiling doors at fire dampers shall be the same as specified in Section 15050. Doors shall be sized for easy access to fire links and not less than 24" x 24".

2.04 FILTERS

Filters shall be as listed in the schedule on the drawings.

Supply the Owner with one complete set of spare filters at completion, for each system.

2.05 TURNING VANES

Turning vanes shall be installed in all square elbows. Turning vanes shall be high efficiency profile type with single surfaced airfoil bladed shapes equal to Aero/Dyne Co., Airsan, Elgen, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF SHEET METAL WORK

All necessary allowances and provisions shall be made in the installation of sheet metal ducts for the structural conditions of the building, and ducts shall be transformed or divided as may be required. Whenever this is necessary, the required area shall be maintained. All of these changes, however, must be approved and installed as directed. During the installation, the open ends of ducts shall be protected to prevent debris and dirt from entering. Whenever exposed ducts pass through walls, floors, or ceilings, a flanged sheetmetal collar fitting close around ducts shall be slipped along duct until flange is tight against finished surface covering edges of openings and presenting as neat appearance. Collar shall be locked to duct.

Contractor shall be familiar with and conform with all state Uniform and Building code regulations. The contractor shall familiarize himself with all building fire walls, ceilings, etc. to the extent that if a discrepancy arises as to the location or omission of fire or smoke dampers, the contractor shall be responsible for the installation of said equipment at no extra charge to the owner.

Spin-in Fittings: Connections to low velocity rectangular ducts shall be by spin-in fittings with integral hand damper. General Environmental, United, Advance Air or Atco.

Cleaning: All ducts, housing, registers, grilles, fans, etc., shall be clean when installed and shall be kept clean until the system is completed. As the various parts of the system are installed, they shall be wiped or blown clean and openings taped dust-tight with heavy paper or cardboard until the system is completed and ready for testing. At that time, all covers and protective wrappings shall be removed. Where one has been torn or previously removed, the duct, coil, register, etc., shall be carefully cleaned of any dirt or dust that has entered the opening.

3.02 DUCTS AT MASONRY

Where ducts are shown connecting to masonry openings and along edges of all plenums at floors and walls, provide a continuous 2" x 2" x 1/8" galvanized angle iron which shall be bolted to the construction and made airtight to the same by applying caulking compound. Sheetmetal in these locations shall be bolted to the angle iron.

3.03 HAND DAMPERS

Install hand operated volume dampers at locations and of sizes shown. Volume dampers shall be controlled by heavy duct locking quadrants mounted on the outside of the duct. Where ducts are insulated, the damper rod shall be extended and the operator shall be mounted on the outside of the insulation. Where volume dampers are installed in ducts over 12" deep, the dampers shall be made in two sections and each independently operated.

All damper fittings must be heavy commercial items and must be approved by the Architect before installation. Hand dampers for room exhaust shall be single blade with locking device mounted inside duct and be accessible by removing exhaust grille. Hand dampers in special exhaust duct systems shall be constructed of the same materials and receive the same coatings as specified for the duct systems.

3.04 CROSS BREAKING

Rectangular sheetmetal ducts shall be cross broken on the four sides of each four-foot panel. All vertical and horizontal sheetmetal barriers, duct offsets, elbows, as well as four-foot panels of straight sections of ducts shall be cross-broken. Cross breaking shall be applied to the sheetmetal between the standing seams or reinforcing angles; the center of cross break shall be of the required height to assure surfaces being rigid.

3.05 TEST HOLES IN DUCTWORK

Furnish test holes in ducts at locations required by the testing and balancing team for testing of air quantities in ducts. Ventlok No. 699 or approved equal closures shall be provided and installed for each test hole, with sufficient neck length to penetrate the insulation.

3.06 HANGERS AND SUPPORTS

It is essential that all ducts shall be rigidly supported. Hangers for ducts up to 18 inches in width shall be placed on not more than 5 foot centers. Where vertical ducts pass through floors or roofs, heavy supporting angles shall be attached to ducts, to structure. Angles shall be of sufficient size to support the ductwork rigidly and shall be placed on at least two sides of the duct.

Construct hangers for rectangular ductwork from galvanized iron 1" x 1/16". Hangers shall extend down the sides of rectangular ducts the full depth of the duct and shall be bent underneath the duct 2". Hangers shall be secured to the duct using sheetmetal screws or rivets of appropriate sizes on 6" centers, but not less than two screws in the side and one in the bottom of each hanger. For rectangular ducts 36" and greater in width, construct hangers from galvanized iron 1-1/2" x 1/16".

3.08 FLEXIBLE CONNECTIONS

Provide flexible connections, not less than 4" wide, constructed of heavy gauge waterproof woven glass fabric at the inlet and outlet connection of each fan unit. Securely fasten to the unit and then to ductwork by galvanized iron bank provided with tightening screws. Install so as to assure no metal-to-metal contact.

3.09 SEALING DUCTWORK

Low pressure ductwork seams shall be taped or caulked after installation when required to prevent air leakage. Exhaust systems with duct runs over twenty-five feet in total system length shall have all joints in the entire system sealed same as for high pressure supply duct.

3.10 TESTING

The complete air tempering system will be tested and balanced as specified in Section 15850. If any equipment fails to produce the specified conditions due to installation, performance or workmanship, the Contractor shall make any necessary changes to satisfy the specified conditions.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS

Unless otherwise noted on the equipment schedule, all mechanical equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflection. All spring type isolators shall have seismic snubbers. Deflections shall be as recommended by the isolator manufacturer based on each equipment operating characteristics.

PART 2 - PRODUCTS

2.01 MOUNTINGS

Double Deflection Neoprene: Mountings shall have a minimum static deflection of 0.35 inches. All metal surfaces shall be neoprene covered to avoid corrosion and have friction pads at both top and bottom so they need not be bolted to the floor. Bolt holes shall be provided for these areas where bolting is required. On equipment such as small vent sets and close coupled pumps, steel rails shall be used above the mountings to compensate for the overhang. Mountings shall be type ND or rails type DNR, as manufactured by Mason Industries, Inc.

Spring Type Isolators: Spring type isolators shall be free standing and laterally stable without any housing and complete with 1/4" neoprene acoustical friction pads between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflections, compressed spring height and solid spring height. Mountings shall be type SLF, as manufactured by Mason Industries, Inc.

Equipment with Different Operating Weights: Equipment with operating weight different from the installed weight such as condensers, etc., and equipment exposed to the wind shall be mounted on spring mountings as described in Spring Type Isolators above, but a housing shall be used that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection.

The installed and operating heights shall be the same. A minimum clearance of 1/2" shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operations. Mountings used out of doors shall be hot-dipped galvanized. Mountings shall be SLR, as manufactured by Mason Industries, Inc.

2.02 VIBRATION HANGERS

Neoprene Element: Vibration hangers shall contain a steel spring and 0.3" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include a scale drawing of the hanger showing the 30 degree capability. Hangers shall be type 30N as manufactured by Mason Industries, Inc.

Rated Deflection: Vibration hangers shall be as described above under Neoprene Element, but they shall be precompressed to the rated deflection so as to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Hangers shall be type PC30N as manufactured by Mason Industries, Inc.

Vibration hangers shall contain a steel spring located in a neoprene cup manufactured with a grommet to prevent short circuiting of the hanger rod. The cup shall contain a steel washer designed to properly distribute the load on the neoprene and prevent its extrusion. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring.

Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Hangers shall be provided with an eye bolt on the spring end and provision to attach the housing to the flat iron duct straps. Submittals shall include a 30 degree capability. Hangers shall be Mason Industries, Inc. type W30.

2.03 BASES

Structural Steel: Vibration isolator manufacturer shall furnish integral structural steel bases. Bases shall be rectangular in shape for all equipment. All perimeter members shall be beams with a minimum depth equal to one tenth of the longest dimension of the base.

Supports: Vibration isolator manufacturer shall provide steel members welded to height saving brackets to cradle machines having legs or bases that do not require a complete supplementary base. Members shall be sufficiently rigid to prevent strains in the equipment. Inverted saddles shall be Mason Industries, Inc. type ICS.

2.04 FLEXIBLE HOSES

Connectors: Flexible neoprene connectors shall be used on all equipment as indicated on the drawings or on the equipment schedule. They shall be manufactured of multiple plies of nylon tire cord fabric and neoprene both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement. Straight connectors shall have two spheres. Connectors up to and including 1-1/2" diameter may have threaded ends. Connectors 2" and larger shall be manufactured with floating galvanized flanges recessed to lock the connector's raised face neoprene flanges. Hoses shall be installed on the equipment side of the shut-off valves.

Connectors shall be rated a minimum of 150 psi at 220-deg.F. Flanged equipment shall be directly connected to neoprene elbows in the size range 2-1/2" through 12" if the piping makes a 90 degree turn at the equipment. All straight through connections shall be made with twin spheres properly pre-extended as recommended by the manufacturer to prevent additional elongation under pressure. Twelve inches and larger sizes operating above 100 psi shall employ control cables with end fittings isolated by means of 1/2" thick bridge bearing neoprene washer bushings designed for a maximum of 1000 psi.

Submittals: Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies.

Elbows: Elbows shall be Mason-Flex type MFNEC, straight connectors Mason Flex type MFTU or MFTNC, and control cable assemblies type ACC, all as manufactured by Mason Industries, Inc.

Stainless Steel Hoses: Flexible stainless steel hoses shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Lengths shall be as tabulated.

FLANGED

3 x 14
4 x 15
5 x 19
6 x 20
8 x 22
10 x 26
12 x 28
14 x 30
16 x 32

MALE NIPPLES

1/2 x 9
3/4 x 10
1 x 11
1-1/4 x 12
1-1/2 x 13
2 x 14
2-1/2 x 18

Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible. Hoses shall be type BSS as manufactured by Mason Industries, Inc.

2.05 ACOUSTICAL FLOOR, CEILING AND WALL SEAL

Where piping passes through equipment walls, floors or ceilings, the vibration isolator manufacturer shall provide a split seal consisting of two bolted pipe halves with 3/4" or thicker neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" past either face of the wall. Where temperatures exceed 240-deg.F, 10# density fiberglass may be used in lieu of the sponge. Seals shall be type SWS as manufactured by Mason Industries, Inc.

2.06 PIPE ANCHORS

Vibration isolator manufacturer shall provide an all directional acoustical pipe anchor, consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum half inch thickness of heavy duty neoprene and duck, or neoprene isolation material. Vertical restraints shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction. All directional anchors shall be Morgan Industries, Inc. type ADA.

2.07 HORIZONTAL THRUST RESTRAINTS

Air handling equipment shall be protected against excessive displacement which might result from high air thrusts in relation to the equipment weight. The horizontal thrust restraint shall consist of a spring element in series with a neoprene pad as described in Paragraph 2.01, Spring Type Isolators, with the same deflection as specified for the mountings or hangers. The spring element shall be contained within a steel frame and designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4" movement at start and stop. The assembly shall be furnished with one rod and angle brackets for attachment to both the equipment and ductwork, or the equipment and the structure.

Horizontal restraints shall be attached at the centerline of thrust and symmetrically on either side of the unit. Horizontal thrust restraints shall be manufactured by Mason Industries, Inc., type WB.

2.08 CURB MOUNTED ROOFTOP EQUIPMENT

Equipment shall be mounted on vibration isolation bases that fit over the roof curb and under the isolated equipment. The extruded aluminum top member shall overlap the bottom member to provide water runoff independent of the seal. The aluminum members shall house cadmium plated springs having a 1" minimum deflection with 50% additional travel to solid. Spring diameter shall be no less than 0.8 if the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4" so as not to interfere with the spring action except in high winds.

The weather seal shall consist of continuous closed cell sponge materials both above and below the base and a waterproof flexible duct-like EPDM connection joining the outside perimeter of the aluminum members. Foam or other contact seals are unacceptable at the spring cavity closure. Caulking shall be kept to a minimum. Submittals shall include spring deflections, spring diameters, compressed spring height and solid spring height as well as seal and wind resistance details. Curb mounted bases shall be Type CMAB as manufactured by Mason Industries, Inc.

2.09 HORIZONTAL PIPE ISOLATION

Equipment Room Seals: All piping passing through the equipment room walls, floors or ceilings, shall be protected against sound leakage by means of an acoustical wall seal as described in Specification M.

2.10 RISER ISOLATION

Risers shall be suspended from or supported by Specification E hangers or Specification C mountings and the piping anchored or guided with Specification N anchors, all as indicated on the riser drawings. Steel spring deflections shall be a minimum of 0.75" except in those expansion locations where additional deflection is required to limit deflection or load changes to plus or minus 25% of the initial stress.

2.11 DUCT ISOLATION

All discharge runs for a distance of 50' from the connected equipment shall be isolated from the building structure by means of Specification F hangers or Specification C floor supports. Spring deflections shall be a minimum of 0.75".

Note: Aforementioned specification "letter" designations are in reference to Mason Industries specifications. Other manufacturers acceptable are Korfund Dynamics, Vibration Mounting and Controls, Amaber-Booth, or approved equal.

PART 3 - INSTALLATION

The installation of all vibration and isolation devices shall be accomplished in strict accordance with the manufacturer's recommendations. All vibration and isolation equipment and devices shall be submitted for final acceptance. All information shall be provided within the contents of the submittal to satisfy the exact requirements of the specified construction and performance characteristics.

All vibration and isolation devices shall be thoroughly loaded and tested to the maximum performance criteria specified. The manufacturer's representative shall prepare written reports reflecting the testing results for each type of vibration or isolation equipment installed. The Contractor shall submit 4 (four) copies of the type written test results for final acceptance.

Any equipment noted to be the cause of transferring excessive vibration or sound transmittance to the building due to inappropriate compliance with the manufacturer's recommendations for installation shall be removed by the Contractor and re-installed. This procedure shall be continued until vibration and isolation devices are proved to perform within the acceptable ranges of the criteria.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS

This specification covers the system balancing for work done in other sections of the mechanical specifications. Also included are combined operating tests and written reports.

Before final acceptance and after final adjustments have been completed, the systems shall be balanced and an operating test performed. Balancing shall not begin until all systems are completed and in full working order. The operating tests and training sessions shall not be performed until the Architect/Engineer has approved the test and balance report.

1.02 INTENT

The intent of this specification is to establish that all components will perform as designed, and to obtain parameters up- and down-stream of each heat exchange device for use in establishing a heat balance and to test for sound when required.

1.03 QUALIFICATIONS

The Contractor, as part of this contract, shall obtain the services of a qualified balancing organization to perform the balancing work as herein specified.

The test and balancing contractor shall be Native Air Co., Design Balance, T & B Services, Inc., Energy Balance, Inc., or prior approved equal.

Prior to bidding the project under this section of the specifications, the balancing organization shall have been approved. The criteria for determining qualifications shall include the following:

Membership in the Associated Air Balancing Council (AABC) or Certification by the National Environmental Balancing Bureau (NEBB).

Having a project engineer registered in the state where the project is to be built, who will be directly responsible for test and balance work.

An office located within a two-hundred-mile radius of the project site.
Any agencies wishing to submit bids for the test and balance work shall request prior approval and provide the Architect no later than three (3) days prior to bid date, a list of projects of a similar type or size as this project with names, addresses, and phone numbers of Owners, Architects, Engineers, and Mechanical Subcontractors. Only qualified (as determined by the project mechanical engineer) engineers and firms will be acceptable.

The professional engineer representing the test and balance firm who will be in charge of test and balance work and certification will be present at the pre-construction conference, to meet with and discuss the project with the other Subcontractors, Owner's and Architect's personnel.

This same engineer must be available on the site when requested by the Contractor to review job progress, establish damper locations, check duct pitot station locations, etc., and the engineer shall prepare and submit reports as needed to keep all parties posted on the testing and balancing work progress and other related problems.

Provide a joint end cooperative effort to coordinate the test and balance with all trades, to solve (not just document) any problems in balancing and control interlocks in order to establish proper system performance before leaving the job, and preparing the final test and balance report.

PART 2 - EXECUTION

2.01 SYSTEM PERFORMANCE CERTIFICATION

The test and balance firm shall certify as to the performance of each mechanical system describing how each is operating. This is particularly important for safety systems such as smoke removal fans, smoke sensors, etc. If the testing and balancing firm's investigation shows up job deficiencies, these shall be corrected as necessary and the systems retested.

All fan units shall be tested and proved free from mechanical defects and to be in good operating condition. Air quantities handled shall be checked by measuring fan speed, fan discharge and suction pressure, duct pitot stations, etc., with simple diagrams showing points of measurement as proved to be as indicated or specified.

Grille discharge and return velocities shall be measured and tabulated with grille performance factor applied to show actual CFM handled versus specified CFM. All grilles, registers and ceiling outlets shall be adjusted to provide correct throw, drop and spread in the air stream to maintain draftless, comfortable conditions.

The Contractor shall also make such other tests as may be required to demonstrate that the air handling and air distribution equipment performance complies with the specification requirements. The air conditioning systems shall be balanced to provide even temperatures throughout the conditioned space for both heating and cooling and shall be checked by the Contractor for both heating and cooling seasons.

Upon completion of all tests, balancing, etc., the data herein requested shall be tabulated in a legible form in triplicate and submitted to the Architect a minimum of two (2) weeks before final inspection. Tests shall be certified by a Registered Professional Engineer. Follow ASHRAE procedures. Main system air quantities shall be balanced to plus or minus 5% of

CFM's specified; room grilles and registers may be plus or minus 10%, however, maintaining a positive, neutral, or negative pressures as shown.

Balance to assure proper flow as systems operate through economizer cycles. Submit (as part of report) duct layouts with all test points noted and identified. Include on these plan sheets specific data to show where each pitot station is, access panel locations, etc.

The Contractor shall provide all thermometers, gauges, air flow testing equipment, etc., required to make the above- mentioned tests and/or prove the equipment performs as specified.

The Contractor shall make any changes in the pulleys, belts and dampers, or the addition of manual balancing dampers, required for correct balance at no cost to the Owner.

2.02 OPERATING TEST AND TRAINING SESSION

At the completion of the work, after final adjustments and calibration, and system balancing are completed and approved, the Contractor shall conduct continuous operating tests during normal working hours from 9:00 a.m. to 4:00 p.m. in the presence of the Inspector. A continuous twenty-four (24) hours recording of specific data shall be made and incorporated along with the operating tests.

The operating tests, unless otherwise indicated, shall be conducted to verify the operation of the mechanical system and demonstrate the performance of the total system. During the test, the following data shall be recorded hourly by the testing and balancing agency, items marked with an asterisk shall be recorded for a twenty-for (24) hour period.

Dry Bulb and Wet Bulb Air Temperatures: Entering and leaving each air washer or cooling coil.

Outdoors (calculate and record relative humidity).

In the conditioned space (calculate and record relative humidity.

Dry Bulb Air Temperatures: Entering and leaving each heating coil.

Water Temperatures (in the various modes of operation): Entering and leaving each heating coil.

Entering and leaving each cooling coil.

Entering and leaving each chiller or boiler.

Pressures: Refrigerant suction pressure.

Refrigerant head pressure.

Weather Conditions: Sun.

Precipitation.

Wind.

Barometric Pressure.

Fluid Flows: Through each cooling and heating coil.

Through each boiler or heat exchanger.

Through each pump.

2.03 TRAINING SESSION

The Contractor and his subcontractors shall conduct training sessions during the operating test. This training session shall inform and train the Owner and/or his appointees for the proper operation and maintenance of all controls and operating equipment installed on the job.

The Contractor will announce the training sessions to all related parties by letter. The letter will establish the following:

Date and time for each session. Three separate six-hour sessions shall be provided to the Owner's operating personnel.

Assigned contractor and subcontractor personnel to perform the test listed by name and their responsibility during the test.

The Contractor shall cause the equipment to operate beginning at start-up through every step, phase, or condition the equipment will normally see in its lifetime.

Where possible, out-of-season operation shall be demonstrated by false loading using the building equipment or by out-of-range adjustment of control devices. The step by step sequence of operation, on line diagrams, listed in the drawings and specifications as well as manufactures instructions shall be utilized as a check off list.

All special operations, not normally known by a mechanic or craftsman in the appropriate field, peculiar to an installed piece of equipment shall be fully explained.

All operations required for the routing and special maintenance of all equipment will be fully described. Such items as cleaning, adjusting and lubrication shall be explained. Factory manuals will be referred to during this session.

On occasions where a factory representative must be on hand for the initial start-up of a piece of equipment, in advance of the formal system training session, he shall perform the training sessions for that piece of equipment at that time.

2.04 TEST REPORTING

Test forms shall include the following information:

Each sheet shall have the building name, the name of the air conditioning contractor, the instruments used to perform the test, the name of the person performing the test, the date the test was performed.

All forms shall be a standard 8-1/2" x 11" good quality paper and bound together to form a complete record. All forms shall be typewritten or hand lettered. Handwritten forms are not acceptable. Five copies shall be submitted to the Architect.

The testing and balancing agency shall include a typewritten report along with the bound test data. The report shall include discussions of the various systems along with listing specific deficiencies in capacities or controlled environments as called for in the design, the apparent reason or causes for each, and suggestions or recommendations for a course of action for correcting the deficiencies.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS

All disconnect means, motor controllers, and all electrical control, protective, and signal devices for equipment furnished under Division 15 of these specifications will be furnished, installed and connected under Division 16 with the following exceptions:

Items scheduled, noted or shown on the drawings or in the specifications to be furnished under Division 15.

Apparatus furnished with, mounted on and connected integral with equipment furnished under Division 15.

Electrical items not shown on the electrical drawings, but required for equipment furnished as a part of Division 15 shall be furnished, installed, and electrically connected in accordance with the procedures described in Division 16.

1.02 SUBMITTALS

Submittal data for each individual electrically controlled item of equipment or device furnished under this Division of these specifications shall include complete electrical wiring diagrams, and elementary control diagrams (ladder form) showing all internal and external wiring connections and services. The submittal data shall itemize all electrical characteristics that are of a special nature or critical to the electrical installation or control system. Such equipment and devices will not be considered for approval until these requirements are met.

As soon as possible after contract notice to proceed, one print of the ladder drawings shall be submitted by the Contractors showing all necessary wiring for the mechanical equipment and devices proposed for installation. This print shall be submitted to the Architect/ Engineer for approval. The print shall indicate all components that are to be wired into the control power circuit with all terminals for external connections of the components identified and labeled to correspond to the manufacturer's designating. Internal or factory installed wiring of package-type components need not be shown.

Revised Drawings: After the Architect/Engineer has approved the marked copy of the control system diagrams submitted in accordance with the above, the Contractor shall issue prints to all involved parties. The control system diagrams shall be certified in writing as being acceptable to the mechanical design engineer, electrical engineer, and the Contractor. The control system diagrams will then be included in the control equipment submittal package.

PART 2 - PRODUCTS

2.01 GENERAL

The materials, equipment and devices related to the electrical system controls are specified under other sections of these specifications.

PART 3 - EXECUTION

3.01 CHANGES DURING CONSTRUCTION

The complete responsibility and costs for revisions made during construction to the approved control diagrams, and the resultant changes to the installation requirements, not covered by contract change order shall be assigned to the respective section of these specifications under which the equipment is furnished.

3.02 INSTALLATION

No control work shall be performed until control system diagram prints have received written approval by the Architect/Engineer.

END OF SECTION