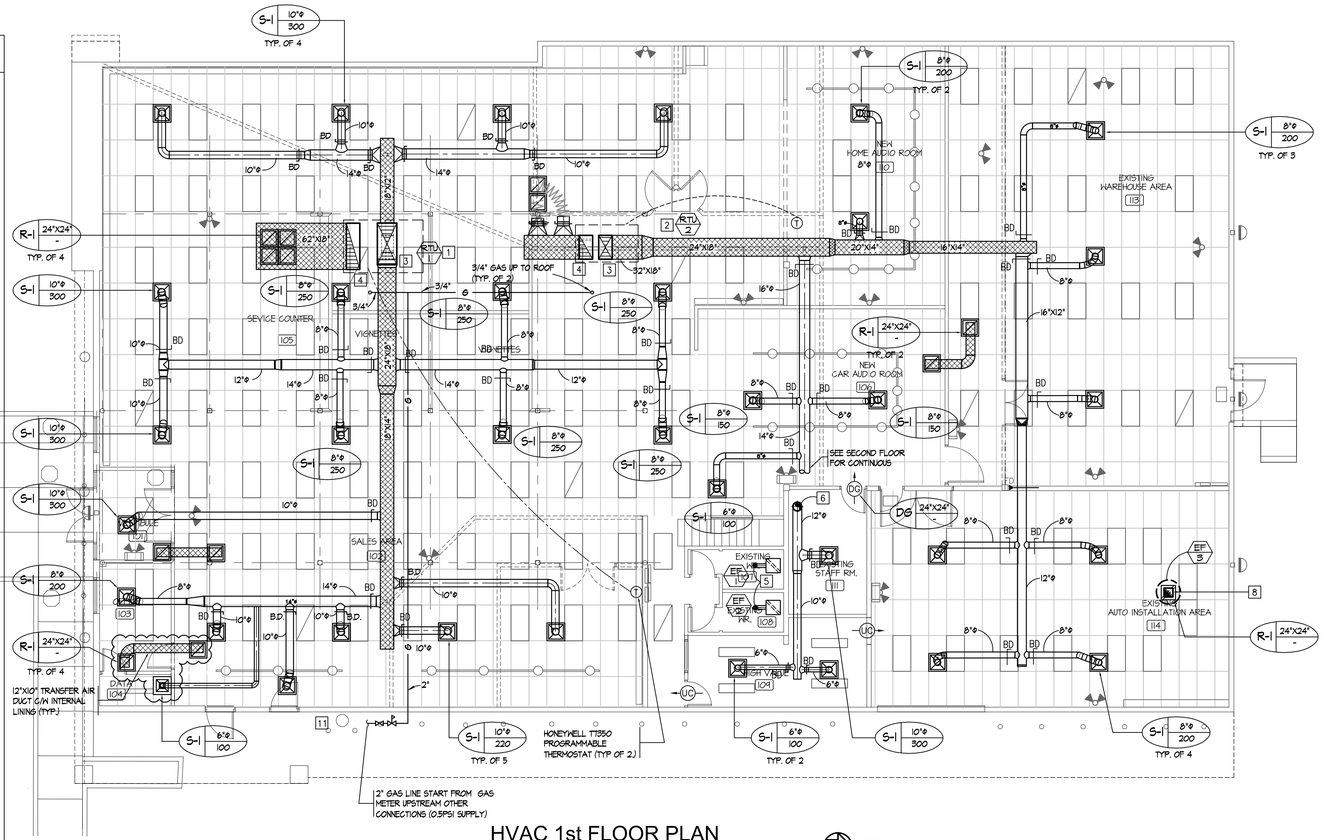
GENERAL NOTES

1. IF ANY EQUIPMENT SUBMITTED FOR APPROVAL HAS A DIFFERENT PHYSICAL SIZE OR ARRANGEMENT FROM THAT SHOWN ON THE DRAWINGS A FULL SET OF SHOP DRAWINGS SHALL BE SUBMITTED TO SHOW ALL INSTALLATION DETAILS.
2. BRANCHES TO DIFFUSER, REGISTERS AND GRILLES SHALL BE SUPPLIED WITH MANUAL VOLUME DAMPERS, DAMPER QUADRANT SHALL BE 3/8 MINIMUM, POSITION TO BE INDICATED BY QUADRANT. ALL DAMPERS THAT ARE INACCESSIBLE SHALL BE PROVIDED WITH REMOTE OPERATORS SIMILAR TO VENT LOCK 677, PLAIN FINISH.
3. MISCELLANEOUS METAL, ANGLES, BRACING OR SUPPORTS EXPOSED TO THE WEATHER SHALL BE GALVANIZED IRON OR BLACK IRON PAINTED WITH ONE COAT OF RUST INHIBITING PAINT AND ONE COAT OF GRAY PRIMER.
4. MECHANICAL CONTRACTOR SHALL COORDINATE THEIR INSTALLATION LOCATIONS WITH OTHER TRADES PRIOR TO INSTALLATION OF EQUIPMENT.
5. INSULATED DUCT SHALL REMAIN UNCOVERED UNTIL DUCT JOINTS HAVE BEEN APPROVED BY THE ENGINEER. IF WORK REQUIRED TO BE INSPECTED IS COVERED BEFORE THE APPROVAL OF THE ENGINEER, IT SHALL BE UNCOVERED FOR INSPECTION AT THIS CONTRACTOR'S EXPENSE.
6. ALL CONTROL WIRING SHALL BE IN CONDUIT AND ARE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. ALL THERMOSTATS SHALL BE MOUNTED 48 INCHES ABOVE FINISHED FLOOR.
7. INTERCONNECTING WIRING SAFETY SWITCHES, RELAYS, CONTROLLERS AND MOTOR STARTERS WHICH ARE INTEGRAL COMPONENTS OF PACKAGED EQUIPMENT SHALL BE PROVIDED AS AN INTEGRAL PART OF THAT EQUIPMENT.
8. EXHAUST DUCT SHALL BE EQUIPPED WITH BACKDRAFT DAMPER
9. FIRE DAMPERS AND/OR COMBINATION FIRE SMOKE DAMPERS SHALL BE PROVIDED FOR ALL DUCT PENETRATIONS THROUGH RATED WALL OR CEILING CONSTRUCTION. LOCATION OF RATED CEILING AND WALLS ARE AS INDICATED ON THE ARCHITECTURAL DRAWINGS.
10. ALL DUCT DIMENSIONS ARE NET INSIDE.
11. FIELD VERIFY CLEAR SPACE AVAILABLE, ROUTING PATH, AND CONFLICTS 32. WITH STRUCTURE, SPRINKLER PIPE, AND THE WORK OF OTHER TRADES. PRIOR TO FABRICATING DUCTWORK, PROVIDE OFFSETS IN DUCTWORK AS REQUIRED, WHETHER SPECIFICALLY INDICATED ON DRAWINGS OR NOT. MAINTAIN CLEARANCE AROUND ALL LIGHT FIXTURES AS REQUIRED TO REMOVE AND SERVICE FIXTURES.
12. CONTRACTOR SHALL INSTALL ALL EQUIPMENT, PIPING, AND DUCTWORK SUCH THAT MANUFACTURERS' RECOMMENDED CLEARANCES ARE MET FOR ALL ACCESS PANELS, MOTORS, FANS, BELTS, FILTERS, AND AIR INTAKES. CONDENSATE LINES SHALL BE CLEAR OF FILTER RACK ACCESS.
13. PROVIDE DUCT FLEX CONNECTIONS & VIBRATION ISOLATION FOR ALL UNITS NOT INTERNALLY ISOLATED.
14. WASTE VENT STACKS, EXHAUST FANS, ETC. SHALL BE A MINIMUM OF 10 FT. FROM OUTSIDE AIR INTAKES.
15. ALL SUPPLY, RETURN, EXHAUST AND OUTSIDE AIR INTAKE DUCTWORK SHALL BE GALVANIZED SHEET METAL.
16. ALL RTU FILTERS SHALL BE OF A READILY AVAILABLE SIZE, OF DISPOSABLE TYPE, AND BE ACCESSIBLE WITHOUT THE USE OF SCREWS OR OTHER MECHANICAL DEVICES REQUIRING TOOLS.
17. ROUT DUCTWORK AS HIGH AS POSSIBLE TO MEET CEILING HEIGHT REQUIREMENTS.
18. ALL WORK AND MATERIALS SHALL BE IN FULL ACCORDANCE WITH THE REQUIREMENTS OF THESE CODES AND ALL APPLICABLE LOCAL ORDINANCES. WHERE CONTRACT DOCUMENTS EXCEED WITHOUT VIOLATING CODE AND REGULATION REQUIREMENTS, CONTRACT DOCUMENTS TAKE PRECEDENCE, WHERE CODES CONFLICT, THE MORE STRINGENT SHALL APPLY.

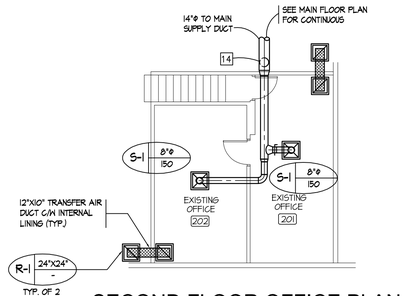
BRITISH COLUMBIA BUILDING CODE
BRITISH COLUMBIA MECHANICAL CODE
BRITISH COLUMBIA PLUMBING CODE
NATIONAL ELECTRICAL CODE



HVAC 1st FLOOR PLAN

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

NORTH



SECOND FLOOR OFFICE PLAN

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

GENERAL HVAC NOTES

1. ALL DUCTWORK DIMENSIONS NOTED ON PLANS REFER TO CLEAR INSIDE OPENING REQUIRED.
2. DUCT FITTING SHALL BE PROVIDED IN ACCORDANCE WITH "DUCT FITTING PROVISIONS" AS SHOWN ON DUCTWORK DETAIL SHEET AND LATEST SMACNA STANDARD.
3. INSTALL MANUAL VOLUME DAMPERS AT ALL S.A. BRANCH DUCTS TO THE DIFFUSER, BRANCH R.A. DUCT AND OTHER LOCATIONS AS SHOWN ON PLANS, EXCEPT FOR AIR DEVICE FURNISHED WITH VOLUME DAMPER.
4. PROVIDE FLEX. CONNECTION AT DIFFUSER NECK. ALL FLEX. DUCT SHALL BE INSULATED AND LIMITED TO 5'-0" IN LENGTH.
5. DUCTED EXHAUST AND RETURN GRILLS SHALL BE HARD DUCT CONNECTED.
6. MOUNT SPACE TEMPERATURE SENSOR / THERMOSTAT @ 48" + A.F.F. VERIFY EXACT LOCATION WITH ARCHITECT & OWNER.
7. SEE ARCHITECTURAL REFLECTED CEILING PLAN, ETC. FOR EXACT LOCATION OF AIR DEVICES.
8. PROVIDE AND INSTALL FIRE OR/AND SMOKE DAMPER (IF REQUIRED) AT FIRE RATE RESISTANCE AS PER N.F.P.A. COORDINATE WITH ARCHITECTURAL TRADE.
9. REMOVE EXISTING ROOFTOP UNIT AND ALL RELATED COMPONENTS SUCH AS DUCTWORKS ETC.
10. REMOVE EXISTING GAS UNIT HEATERS AND ALL RELATED COMPONENTS SUCH AS GAS PIPES, STACK, ETC
11. PROVIDE FLEX. CONNECTION AT SUPPLY AND RETURN DUCT CONNECT TO EACH ROOFTOP UNIT

KEY NOTES:

1. PACKAGE ROOFTOP UNIT "RTU-1",ECONOMIZER, DDC CONTROLS, CURB, APPROX. 2,300 LBS, 4" HIGH DENSITY RIGID INSULATION AND TWO LAYERS OF 1/2" GYP. BOARD TO COVER ENTIRE ROOF SURFACE AREA WITHIN CURB
2. PACKAGE ROOFTOP UNIT "RTU-2", ECONOMIZER, DDC CONTROLS, CURB, APPROX. 1,250 LBS, 4" HIGH DENSITY RIGID INSULATION AND TWO LAYERS OF 1/2" GYP. BOARD TO COVER ENTIRE ROOF SURFACE AREA WITHIN CURB
3. CONNECT S.A. VENED ELBOW INLET AND OUTLET TRANSITION IN THE VERTICAL TO UNIT CONNECTION
4. CONNECT R.A. FROM UNIT TO R.A. DUCT FROM SPACE
5. NEW EXHAUST DUCT CONNECT TO EXISTING DUCT. SZIE TO MATCH WITH EXISTING.
6. 12"ø S.A. DOWN FROM SECOND FLOOR.
7. N/A
8. NEW EXHAUST FAN ON ROOF INTERLOCK WITH RTU-2 C/W ROOF CURB ALSO BACKDRAFT DAMPER. EXHAUST DUCT 12"X12" CONNECTED TO FAN
9. N/A
10. N/A
11. EXISTING GAS METER
12. CONDENSATE PIPING
13. OFFSET DUCT TO ABOVE CAR AUDIO ROOM'S CEILING
14. 12" OFFSET DUCT TO THE MAIN FLOOR STAFF ROOM.
15. NEW ROOF DRAIN

DIFFUSER & GRILLE SCHEDULE

S-1	CEILING DIFFUSER 24"x24" ROUND NECK STELL CEILING DIFFUSER WITH LAY-IN TILE FRAME FOR T-BAR OR SURFACE MOUNT FOR DRYWALL CEILING AND OFF-WHITE BAKED ENAMEL FINISH C/W VCR7 O.B.D. E.H. PRICE: SCD-31-3C-B13
R-1	EXHAUST OR RETURN REGISTER ALUMINUM EGGCRATE EXHAUST OR RETURN REGISTER WITH FLAT FACE BORDER, FOR SURFACE MOUNT OR T-BAR CEILING INSTALLATION, CONCEALED MOUNTING AND OFF-WHITE BAKED ENAMEL FINISH. E.H. PRICE: 90 SERIES
DG	**DOOR GRILLE** STEEL INVERT V DOOR GRILLE C/W AUXILIARY FRAME ASSEMBLY. **E.H. PRICE: 530 D-F-L-O-B13.**

LEGEND

TAG SIZE FLOW	GRILLE REGISTER AND DIFFUSER DESIGNATOR
UNIT TAG	EQUIPMENT UNIT TAG
	CEILING DIFFUSER
	CEILING RETURN GRILLE
	EXHAUST AIR UP
	RETURN AIR UP
	SUPPLY AIR UP
	EXHAUST AIR DOWN
	RETURN AIR DOWN
	SUPPLY AIR DOWN
BD	BALANCING DAMPER
FD	HORIZONTAL FIRE DAMPER
	MOTORIZED FLOW CONTROL DAMPER
BDD	BACKDRAFT DAMPER
	ACOUSTICALLY LINED DUCT
	FLEXIBLE DUCT CONNECTOR
	SQUARE ELBOW WITH TURNING VANES
	FLEXIBLE DUCT
T	THERMOSTAT
S	REMOTE TEMERATURE SENSOR
P	AIR PRESSURE SENSOR
DG	DOOR GRILLE
UC	UNDERCUT DOOR
A.P.	ACCESS PANEL

DATE	ISSUE	REV
2013/04/02	ISSUED FOR CONSTRUCTION	3
2013/01/11	ISSUED FOR TENDER	2
2012/12/13	ISSUED FOR BUILDING PERMIT	1

ARCHITECT

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BURNABY, BRITISH COLUMBIA
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Certified Professional Member of the NWTAA

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DEC engineering sustainability
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NEW WESTMINSTER, B.C, CANADA V3M 1B2
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DRAWINGS@DECMAIL.CA
ENGINEERINGSUSTAINABILITY.COM

SEAL

DRAWN BY	APPROVED
TZ	RP

PROJECT

EXISTING BUILDING ALTERATION FOR VISIONS

5756 IMPERIAL STREET
BURNABY, BC

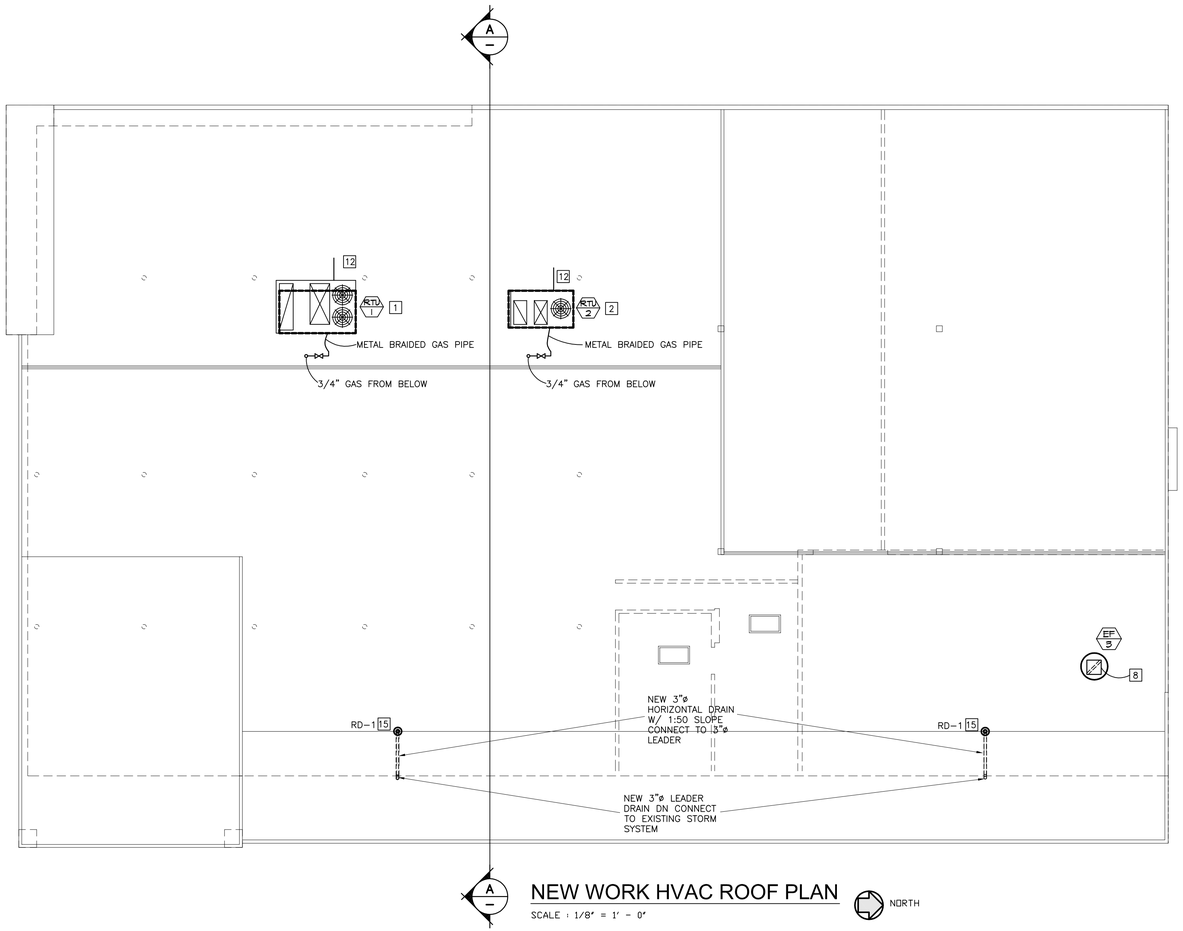
DRAWING

1st & 2nd FLOOR PLANS - HVAC

PROJECT NUMBER	DRAWING NUMBER
D12-035	M-1

SCALE AS NOTED

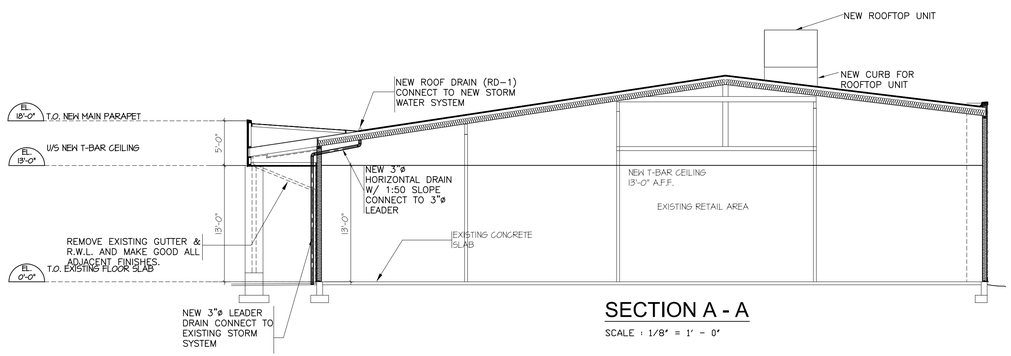
DATE 2012-12-13



NEW WORK HVAC ROOF PLAN

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

NORTH



SECTION A - A

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

KEY NOTES:

1. PACKAGE ROOFTOP UNIT "RTU-1",ECONOMIZER, DDC CONTROLS, CURB, APPROX. 2,300 LBS, 4" HIGH DENSITY RIGID INSULATION AND TWO LAYERS OF 1/2" GYP. BOARD TO COVER ENTIRE ROOF SURFACE AREA WITHIN CURB
2. PACKAGE ROOFTOP UNIT "RTU-2", ECONOMIZER, DDC CONTROLS, CURB, APPROX. 1,250 LBS, 4" HIGH DENSITY RIGID INSULATION AND TWO LAYERS OF 1/2" GYP. BOARD TO COVER ENTIRE ROOF SURFACE AREA WITHIN CURB
3. CONNECT S.A. VENED ELBOW INLET AND OUTLET TRANSITION IN THE VERTICAL TO UNIT CONNECTION
4. CONNECT R.A. FROM UNIT TO R.A. DUCT FROM SPACE
5. NEW EXHAUST CEILING FAN CONNECT TO EXISTING DUCT
6. 10"ø S.A. UP TO MEZZANINE
7. 10" R.A. DN FROM MEZZANINE TO RETURN AIR DUCT FOR RTU-2
8. NEW EXHAUST FAN ON ROOF INTERLOCK WITH RTU-2 C/W ROOF CURB ALSO BACKDRAFT DAMPER. EXHAUST DUCT 12"X12" CONNECTED TO FAN
9. 10"ø S.A. DN TO SUPPLY DUCT FROM RTU-2
10. 10" R.A. DN TO RETURN AIR DUCT FOR RTU-2
11. EXISTING GAS METER
12. CONDENSATE PIPING
13. OFFSET DUCT TO ABOVE CAR AUDIO ROOM'S CEILING
14. OFFSET DUCT TO THE OFFICE IN SECOND FLOOR.
15. NEW ROOF DRAIN

GENERAL HVAC NOTES

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8. PROVIDE AND INSTALL FIRE OR/AND SMOKE DAMPER (IF REQUIRED) AT FIRE RATE RESISTANCE AS PER N.F.P.A. COORDINATE WITH ARCHITECTURAL TRADE.
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11. PROVIDE FLEX. CONNECTION AT SUPPLY AND RETURN DUCT CONNECT TO EACH ROOFTOP UNIT

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2013/01/11	ISSUED FOR TENDER	2
2012/12/13	ISSUED FOR BUILDING PERMIT	1
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SEAL

DRAWN BY: TZ
APPROVED: RP

PROJECT

EXISTING BUILDING ALTERATION FOR VISIONS

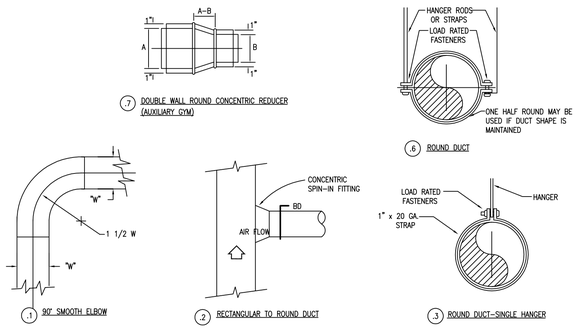
5756 IMPERIAL STREET
BURNABY, BC

DRAWING

ROOF PLAN - HVAC

PROJECT NUMBER: D12-035
DRAWING NUMBER: M-2

SCALE: AS NOTED
DATE: 2012-12-13



.1 90° SMOOTH ELBOW

.2 RECTANGULAR TO ROUND DUCT

.3 ROUND DUCT-SINGLE HANGER

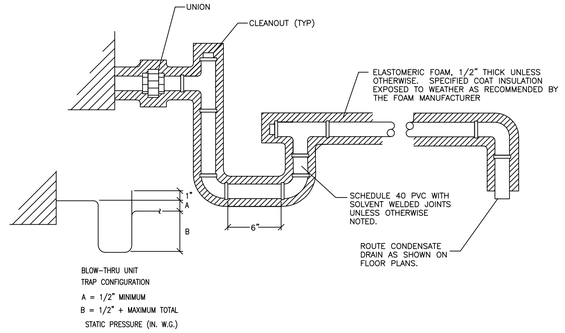
.4 ROUND DUCTS SHALL BE SUPPORTED NO MORE THAN 12' O.C.

.5 RECTANGULAR TRANSITION

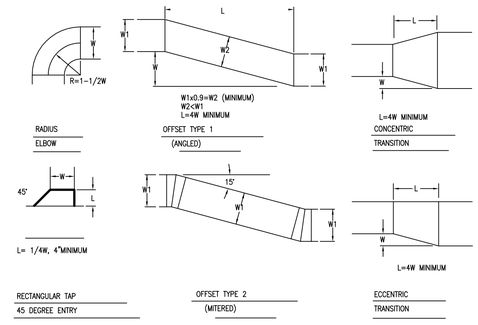
.6 ROUND DUCT

.7 DOUBLE WALL ROUND CONCENTRIC REDUCER (AUXILIARY GYM)

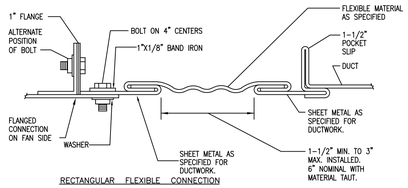
TYPICAL DUCT DETAIL
N.T.S.



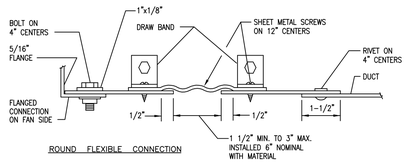
CONDENSATE TRAP AND DRAIN DETAIL
N.T.S.



STANDARD DUCT CONSTRUCTION DETAIL
N.T.S.



RECTANGULAR FLEXIBLE CONNECTION

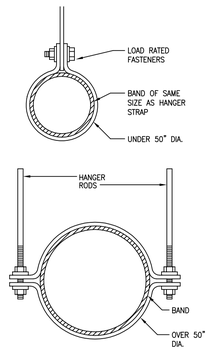


ROUND FLEXIBLE CONNECTION

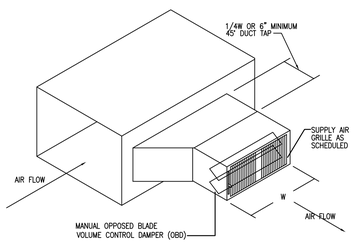
DUCT FLEXIBLE CONNECTION DETAIL
N.T.S.

HANGER SIZING AND SPACING SCHEDULE					
MAX. DUCT DIA.	WIRE (DIA.)	ROD	STRAP	MAX. LOAD LBS.	MAX. SPACING FT.
10"	ONE 12 GA.	ONE 1/4"	ONE 1" x 22 GA.	260	12'
18"	TWO 12 GA.	ONE 1/4"	ONE 1" x 22 GA.	260	12'
24"	TWO 10 GA.	ONE 1/4"	ONE 1" x 22 GA.	260	12'
36"	TWO 8 GA.	ONE 3/8"	ONE 1" x 22 GA.	320	12'
50"	N/A	TWO 3/8"	TWO 1" x 20 GA.	700	12'
60"	N/A	TWO 3/8"	TWO 1" x 18 GA.	1320	12'
84"	N/A	TWO 1/2"	TWO 1" x 16 GA.	2500	12'

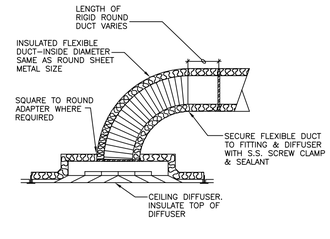
NOTE:
1. TABULATED DATA FROM SMACNA ALLOWS FOR DUCT REINFORCING AND INSULATION, BUT NO EXTERNAL LOAD.
2. STRAPS SHALL NOT BE USED ON EXPOSED DUCTWORK.



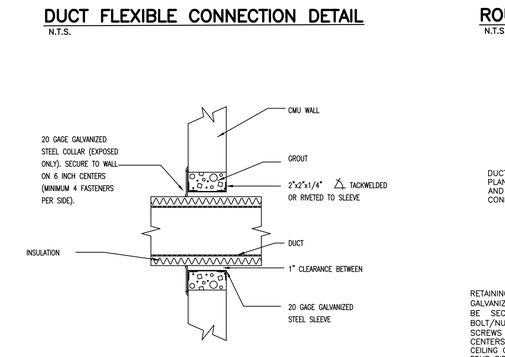
ROUND DUCT HANGERS DETAIL
N.T.S.



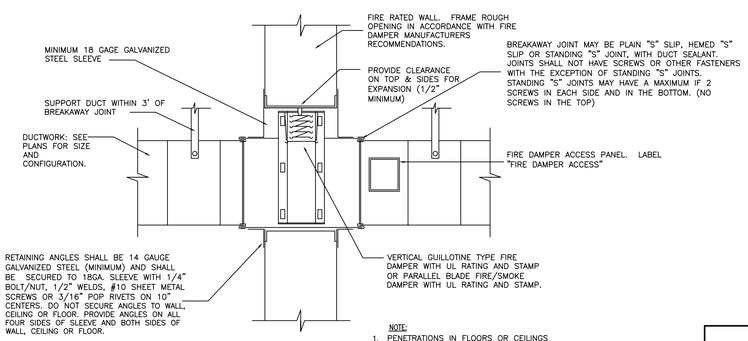
BRANCH DUCT DETAIL WITH OBD
N.T.S.



CEILING DIFFUSER CONNECTION DETAIL
N.T.S.

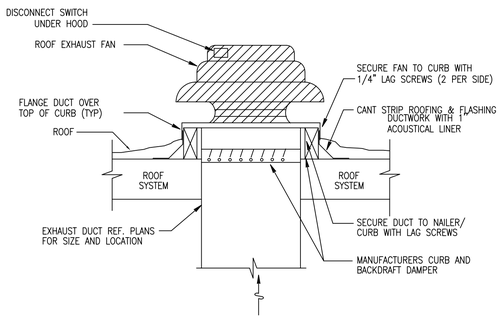


DUCT PENETRATION THROUGH WALL DETAIL (NOT APPLICABLE TO FIRE-RATED WALLS)
N.T.S.

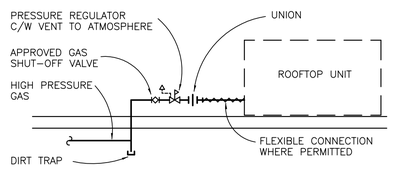


NOTE:
1. PENETRATIONS IN FLOORS OR CEILINGS SHALL BE SIMILAR EXCEPT A HORIZONTAL FIRE DAMPER SHALL BE USED.

DUCT PENETRATION THROUGH FIRE RATED WALL CEILING OR FLOOR DETAIL
N.T.S.

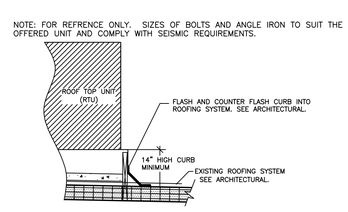


ROOF MOUNTED EXHAUST FAN DETAIL N.T.S.

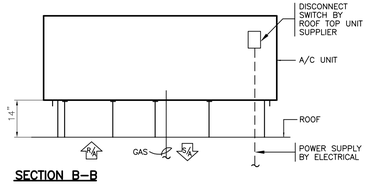


GAS CONNECTION DETAIL N.T.S.

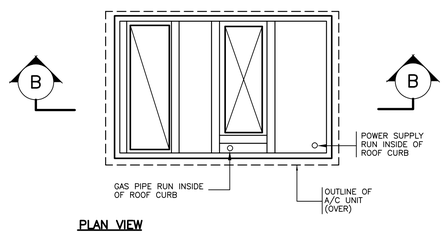
NOTE: ROOFTOP PIPING SHALL BE PROTECTED AGAINST CORROSION BY EITHER COMMERCIAL WRAPPING OR BY APPLICATION OF TWO COATS OF AN APPROVED WEATHER RESISTANT PRIMER PAINT FOLLOWED BY ONE COAT OF WEATHER RESISTANT ENAMEL.



ROOFTOP UNIT AND ROOF CURB DETAIL
(N.T.S.)

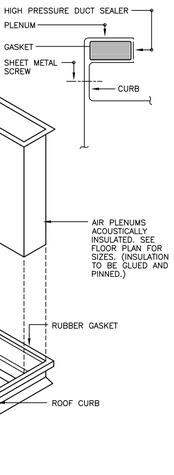


SECTION B-B

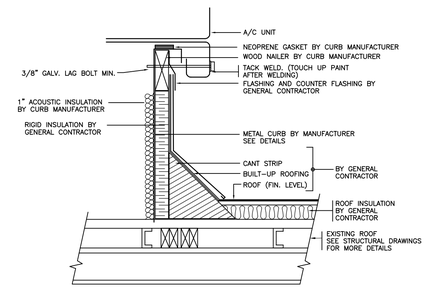


PLAN VIEW

ROOF CURB DETAIL
(N.T.S.)



PLENUM INSTALLATION DETAIL
(N.T.S.) PLEN-INS.DWG



ROOF TOP UNIT MOUNTING DETAIL
(N.T.S.)

2013/04/02	ISSUED FOR CONSTRUCTION	3
2013/01/11	ISSUED FOR TENDER	2
2012/12/13	ISSUED FOR BUILDING PERMIT	1
DATE	ISSUE	REV

ARCHITECT

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Member of the NWTAA

MECHANICAL CONSULTANT

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SEAL

DRAWN BY	APPROVED
TZ	RP

PROJECT

EXISTING BUILDING ALTERATION FOR VISIONS

5756 IMPERIAL STREET
BURNABY, BC

DRAWING

DETAILS
- HVAC

PROJECT NUMBER	DRAWING NUMBER
D12-035	M-3

SCALE
N.T.S

DATE
2012-12-13

HVAC SPECIFICATIONS:

1. GENERAL CONDITIONS:

1. The instructions to the Contractor and requirements of General conditions apply to work under this trade.
2. All bids must be based on materials specified as standard.
3. Contractors shall familiarize themselves with site conditions prior to submitting bids. Claims for extras due to site conditions will not be accepted.
4. Provide functioning systems that are complete in every detail and installed in accordance with good practice as per the Mechanical Contractor's Association of British Columbia documents:
   "Code of Practice for Commissioning Mechanical Systems in Buildings" February, 2001; and
   "Code of Practice for Contractors within Division 15 Mechanical" JULY, 1985.
5. No heating and HVAC equipment may be used for temporary heating and/or ventilation during construction without prior approval from the Engineer. If approval is granted, the Contractor shall be responsible to return the Heating and HVAC equipment to "as new" condition before substantial completion inspection.
6. The Mechanical Contractors shall provide all control wiring diagrams for the HVAC equipment. 24 volt wiring and conduit shall be provided and installed by the Mechanical Contractor. Provide 24 volt transformers as required.

2. DRAWINGS AND SPECIFICATIONS

1. Contract drawings for Mechanical work are, in part, diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment, piping and ductwork. The Contractor shall lay out the work at the site and provide any necessary offsets and adjustments to suit site conditions and avoid conflict with other trades.
2. Care shall be taken to ensure that the installation is in accordance with detailed drawings, where given, and that the installation meets the design requirement.
3. The drawings and specifications are intended to be complementary. Anything called for in these specifications or shown on the drawings shall be considered as appearing in both and shall form part of the contract documents.
4. Take any information involving accurate dimensions of the building from the figured dimensions of the structural and architectural drawings or by measurements of the building of the site.
5. Any discrepancies found between drawings and specifications, leaving in doubt the true intent or meaning shall be brought to the attention of the engineer prior to the work being performed.
6. The term "provide" where used shall be understood to include labour, materials and services to supply and install the item or work referred to.

3. CODES AND PERMITS:

1. Comply with all applicable codes, obtain all necessary approvals and pay for all necessary permits prior to commencement of work.
2. All materials and equipment shall have prior approval for the application, from the authorities having jurisdiction, e.g. Canadian Standards Association (CSA.), Canadian Gas Association (CGA), etc.
3. All work shall conform to the applicable codes including but not limited to the following:
   .1 The B.C. Building Code latest edition and local building by-law.
   .2 The SMACNA HVAC Duct Construction Standards, 1st edition, 1995, Class C Pressure Rating.
   .3 The B.C. Electrical Code.
   .4 The Natural Gas and Propane Installation Code B149.1-10 and the B. C. Gas Safety Code and Amendments.
   .5 HVAC equipment shall be designed and installed in conformance with the requirements of part 6 of the B.C. Building Code.

4. INSPECTIONS AND APPROVALS:

1. All work and materials will be subject to inspection from time to time, by the Engineer and the authority having jurisdiction. Inform the Engineer 48 hours in advance of any tests, covering, burying or concealment of services to allow for inspection. Do not cover, bury or conceal services without the Engineer's approval.
2. Do not change any material, equipment or construction method from what is shown on the drawings and specification without the approval of the Engineer. Any changes made without the Engineer's authorization may result in the work not being accepted and/or delay in issuance of the final letter of assurance.
3. The documents indicate the minimum standards to be applied to the work. Any approval of, or agreement to, a lower standard, by any person or authority will not necessarily be approved by the Engineer and may result in the work not being accepted and/or delay in issuance of the final letter of assurance.

5. SUBMITTALS:

1. Prior to commencement of work, submit at least 3 copies of complete shop drawings on all specified or approved equal materials to be used. Allow 5 working days for the Engineer to review.
2. The Contractor shall be responsible for delays caused by any required re-submission of shop drawings.
3. The Engineer's review is for general compliance with the intent of the contract documents and will not relieve the Contractor from responsibility for correctness of performance, function, details and dimensions.
4. Where alternate equipment has been submitted, the Contractor bears responsibility for any re-design and construction required to accommodate the alternate equipment.
5. If approval is received to use other than specified items, responsibility for specified capacities, and assurance that items to be furnished will fit the space available, lies with the Contractor.
6. If non-specified equipment is used and it will not fit job site conditions or not meet with local code requirements, the Contractor assumes responsibility for replacement with items named in the contract documents which will comply.
7. The shop drawings do not supersede the Contract Documents.

6. MAINTENANCE MANUALS:

1. On completion of construction, submit 3 sets of information covering covering the operation and maintenance of all mechanical equipment. Insert the information in suitable 3-ring binders and submit to the Engineer for approval.
2. Manuals shall include a description of the operation of the HVAC systems, approved balancing report, copies of all permits, test reports, final inspection certificates and approvals, copies of all shop drawings, operating instructions for all equipment, maintenance schedules for all equipment, copies of all guaranties and names and addresses of contractors and suppliers.

7. AS BUILT DRAWINGS:

1. Obtain extra sets of drawings to mark up as the work progresses. Show any and all changes and deviations in runs of ductwork, piping, risers or equipment locations which differ from the contract drawings. These drawings shall be kept on site, and shall be available for review at all times.
2. When the installation is complete, submit the complete marked-up as-builts to the Consultant. Drawings shall be clean and legible with an acceptable standard of drafting and each sheet shall bear the Contractors name and be identified as as-built. Provide a letter certifying that these drawings accurately reflect the systems as built.
3. Include a Cash Allowance in the contract to cover the cost for the Consultant to incorporate the as-built information into the drawings and to provide a set of final vellum plots for forwarding to the Owner. The cash allowance to be included is $100.00 per drawing.

8 GUARANTIES:

1. Provide a written guaranty of all material, workmanship and system performance for a period of (1) year after final acceptance. and replace forthwith any defective work during this period.
2. This guaranty shall not override any specific guaranties provided or requested of longer duration.

9 INSTALLATION:

1. Provide access doors for all concealed serviceable components. Access doors shall have code required fire ratings.
2. Provide isolating valves in branch lines to each piece of equipment.
3. Identify all equipment and piping system with labels and stick on decals to indicate service and direction of flow. Labels shall be in black formica with white reveal on engraving. Labels shall contain equipment tag and area served.
4. Install pipes with allowance for expansion, contraction and settling. Heating hot water pipes shall have expansion joints, loops or offsets as shown on the drawings and/or at least every 100 feet of straight run. Provide pipe anchors between expansion elements.
5. Co-ordinate locations and sizes of required HVAC chases and any additional bracing between studs for wall hung equipment.
6. Co-ordinate any required cutting of structure, to facilitate passage of pipes and duct, with the General Contractor.
7. Ensure that the integrity of all fire separations is maintained where piping and ductwork systems penetrate rated structures. The Contractor shall seal tight around all piping with approved caulking material and provide a fire damper or fire flap for required fire-protection rating.
8. Thermostats and wall mounted sensor equipment, shall be located, generally, as shown. The exact location shall be field co-ordinated to avoid interference with wall mounted items and to protect from excessive radiant heat from other sources.

10 CO-OPERATION WITH OTHER TRADES:

1. Give full co-operation to other sub-trades and furnish any information necessary to permit the work of all Sub Trades to be installed satisfactorily and with the least possible interference or delay.
2. Install all equipment, piping and ductwork to obtain ceiling heights specified or shown on the architectural drawings. In case of conflict, notify the Engineer before fabricating and installing any item referred to above. Carry out any required adjustment.

11 MATERIALS AND WORKMANSHIP:

1. Unless otherwise specified, all materials and apparatus required for work shall be new, of first class quality and shall be furnished, delivered, erected, connected and finished in every detail. Items shall be selected and arranged so as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first class standard article as approved by the Engineer shall be furnished.
2. Use skilled and qualified, fitters, plumbers, metal workers, welders, helpers and labour required to unload, transfer, erect, connect up, adjust, start, operate and test such systems. Helpers and unqualified workers shall be supervised at all times, by qualified tradesmen, while working on the site.
3. Upon request, the Contractor shall produce copies of trade qualifications of any selected workers.
4. The Engineer shall have the right to reject any item that, in his/her opinion, does not conform to an acceptable standard of quality, quietness of operation, finish, appearance and performance. Unacceptable material and/or workmanship must be rectified to the approval of the Engineer.

12 TESTING AND BALANCING OF THE SYSTEM:

1. The Contractor is responsible for the inspection of the complete ventilation and exhaust systems to ensure that they are installed in accordance with the intent of the plans and specifications. During the inspection:
   .1 Adjust fan drives to get required and rated CFM and specified rpm;
   .2 Adjust temperature and fan control sequences;
   .3 Adjust the entire installation to minimize noise and vibration from fans, compressors, starters and relays.
   .4 Eliminate any duct pulsation by use of stiffeners or additional supports as required;
   .5 Correct any equipment or component which is generating objectionable noise in the opinion of the owner or by local authorities;
   .6 Ensure that there are no air leaks;
   .7 Ensure that the ductwork is properly supported;
   .8 Ensure that all duct connections are securely fastened to their respective collars or other fittings in order that they will not unfasten under maximum system pressure.
2. The Contractor shall be responsible for checking capacities of the ventilation and exhaust systems and equipment specified. Tolerance shall be +/-10% of the quantities noted on the drawings or in the equipment schedules.
3. The Contractor shall provide and co-ordinate services of an independent air testing and balance agency, specializing in testing and balancing heating and air conditioning systems.
4. On completion of the project, the independent air testing and balancing agency shall submit balance reports to the Engineer for review.

13 SHEET METAL DUCTWORK:

1. Fabricate all ductwork from G90 galvanized sheet in accordance with SMACNA Standards. Do not use rigid fibreglass ductwork. All ducts shall be constructed for one inch pressure, Class C seal.
2. Seal all sheet metal duct joints and seams with 3m duct sealer or aluminum foil pressure tape, to the requirement of SMACNA Class C. Use of duct tape is not acceptable.
3. Elbows shall be a minimum radius of 1.5 times duct dimensions.
4. Duct dimensions are noted as clear inside.
5. When flexible duct is used, it shall be Flexmaster Fab 4T UCL Approved Class 1 Duct, insulated with 1" Fibreglass insulation and vinyl jacketed. Flexible duct shall be connected so that a 25 lb. force will not cause it to disconnect. Flexible metal duct is not acceptable.
6. Provide conical take-offs on all right angle connections in supply air ductwork.
7. All ductwork behind side wall registers and return air grilles shall be painted flat black.
8. Supply and install Access Panels/Doors for all concealed components requiring access. All Access Panels/Doors shall be installed by this Contractor.
9. Transition all ducts as required for attachment to equipment.
10. All square elbows shall have turning vanes.
11. All dryer vents shall pitch continuously to the outside louvre.
12. All dryer vents shall be taped and sealed. Do not screen the exhaust end of the vent system, nor use screws or rivets to assemble the ductwork.

14 VIBRATION ISOLATION:

1. Each fan shall be provided with vibration isolation and flexible duct connections of a minimum of 4" (100mm) of reinforced neoprene.
2. Select isolation equipment in accordance with the Manufacturer's instructions for the appropriate loads and frequencies to provide optimum isolation.

15 SEISMIC REQUIREMENTS:

GENERAL

1. The Contractor shall provide Seismic Restraints for all equipment, piping, and duct-work, that meet the requirements defined by the Vancouver Building By-Law 2007, and "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems" (SMACNA and PPIC)
2. The Contractor shall retain a B.C. Professional Structural Engineer to review the adequacy of seismic restraint of all equipment, piping, and duct work and shall abide by all recommendations of the Structural Engineer.
3. The Contractor shall provide the Engineer of Record with the necessary shop drawings, including details of seismic restraint, sealed by the Structural Engineer.
4. The Structural Engineer shall issue Letters of Assurance (Schedules B1, B2 and C-B1 for the structural requirements for mechanical, plumbing, and fire protection systems, including anchorage and seismic restraint.
5. The Equipment Manufacturer shall design equipment such that the strength and anchorage of internal components exceeds the force level used to restrain and anchor the equipment to the supporting structure.

16. SPECIFIC

The following rules apply to the attachment of restraints to structural members:

1. Loads applied to unsupported spans of wood framing shall be carried by bracing to adjacent framing.
2. Do not apply lateral loads to the bottom chord of OWSJ.
3. Apply vertical loads to the bottom chord of OWSJ only at the panel point.
4. Anchors on framing members shall be coach bolts passing through the member with oversize washers.
5. Anchors in concrete shall be expansion and sleeve type.
6. Screws in wood framing shall be used for shear loads only, not pull-out loads.

The following rules apply to the restraint of piping:

1. Where the hangers are more than 12" (300mm) in length from the top of the pipe or duct to the bottom of the structural support, seismic restraints shall be provided for the following.
2. Fuel, gas, oil, and compressed air piping 1" diameter and larger. Lateral or transverse restraints at 20ft. spacing and longitudinal restraint at 40ft. spacing.
3. All other piping in boiler and mechanical equipment rooms 1¼" diameter and larger.
4. All other piping 2½" diameter and larger, including domestic water and drainage piping.
5. All rectangular ductwork 6 sq.ft. (0.5 sq. m) cross sectional area and larger, or round ductwork 28" (700 mm) diameter and larger.

The following rules apply to the restraint of equipment:

1. All resiliently mounted equipment shall be provided with seismic snubbers.
2. All floor-mounted equipment shall be bolted to the floor.
3. Vertical tanks and water heaters shall be bolted to the floor and further secured with an encircling strap at the mid point, with rigid bracing to the structure.

17. INSULATION:

1. External ductwork insulation shall be one inch reinforced foil faced fiberglass duct insulation. Use rigid insulation in exposed locations. Tape all joints. All material and workmanship shall conform to NFPA 98a standards and BCICA Quality Standards for Mechanical Insulation Sixth Edition 2003. Externally insulate the following ducts:
   .1 Outside air intakes inside heated spaces.
   .2 Exhaust ducts through unheated spaces.
   .3 Supply and return air duct except those exposed in air conditioning space.
2. All ductwork shown cross hatched on the drawings shall be lined on all surfaces with one inch neoprene faced fibreglass acoustic insulation.
3. The backside of all diffusers shall be insulated with 1" fibreglass insulation.
4. All supply and return air plenum from roof top unit to ceiling shall complete with 2" internal lining.
5. Minimum insulation R-Values shall be in accordance with table 6.2.4.1.3 and 6.2.4.1.2 A and 2 B as shown on this drawing and ASHRAE 90.1 – 2004.

18. SCHEDULE OF APPROVED EQUIPMENT

1. This contract shall be priced and awarded based on the equipment and systems as specified, or approved "equal". Submittals and requests for "alternate" equipment and systems shall be made, in writing, 7 days prior to close of tender. Upon acceptance copy shall be included as an addendum issued by the Consultant.
2. No consideration shall be given to "alternate" equipment after award of contract.
3. The responsibility of ensuring timely delivery of all specified equipment rests solely with the Contractor.
4. The manufacturer or agent of any equipment who has requested "alternate" status shall be responsible to ensure that his equipment meets specifications, building space limitations and system operation requirements in all respects. Any revisions required by the Consultant to ensure operation and compatibility of alternate equipment shall be charged back to the Contractor at an hourly rate.

19. ROOFTOP UNIT CONTROLS

See schedules attached

20. INSULATION STANDARD:

.1 All insulation work shall be in strict accordance with b.c.i.c.a. standard and the 2003 national building code and be carried out by an experienced firm with an established reputation in this field, and to the satisfaction of the architect/engineer.

.2 All condensate drain piping to be insulated with fibreglass insulation with vapour barrier. seal all joints.

.3 Insulation to be as manufactured by manson insulation or knauf industries. One piece moulded insulation with self sealing adhesive. all fittings to be complete with one piece pre moulded high impact pvc fitting covers.

21. CONDENSATE DRAINS:

.1 Furnish labour and material for the installation of condensate drains and traps for air conditioning equipment, coordinate location and size with equipment installer.

.2 Provide indirect connections to sanitary or storm drainage system in accordance with local requirements.

22. GAS PIPING:

.1 Make arrangements with local gas utility to install gas meter and pay for connection charges and gas meter upgrade. Provide pressure regulating valves, shut-off valves dirt traps and flexible connections as required.

.2 Supply all material and labour for the gas piping to each gas appliance as shown on the drawings.

.3 All exposed piping at exterior of building shall be protected against corrosion by either commercial wrapping or by application of two coats of an approved weather resistant primer paint followed by one coat of weather resistant enamel.

.4 Identify gas piping with yellow paint or banding in accordance with CSA B149.

.5 Gas piping to be installed in accordance with CSA 149.1-10 natural gas code with B.C. amendments.

.6 Gas piping material shall be threaded schedule 40 steel pipe to ASTM A53/A 53M or ASTM 106, steel fittings to ASME B16.3.

23. FIRE DAMPERS:

1. FIRE DAMPERS IN DUCTWORK.

.1 UL tested – folded shutter Type B Fire Damper

.2 1 1/2 hour minimum fire rating and to the approval of the authority having jurisdiction.

2. FIRE DAMPERS BETWEEN TRANSFER GRILLES.

.1 UL tested – folding shutter type.

.2 1 1/2 hour minimum fire rating and approval of the authority having jurisdiction.

.3 UL approved fusible links with a melting point 50 deg.F above the maximum temperature that would be encountered with the system in operation or shut down.

.4 Combination volume control and fire damper is acceptable as alternate to individual volume control and fire damper.

.5 Fire damper ratings shall be suitable for the building fire separation rating. See Architectural Drawings for fire ratings.

.6 All fire dampers shall be rated for dynamic systems application except those HVAC systems which are automatically shut down in the event of a fire (not smoke).

24 ROOF TOP HEATING AND COOLING UNIT

Each roof top unit shall be controlled by a programmable heating/cooling thermostat.

COOLING:
When the thermostat calls for cooling, the condenser fan motor & compressor will start to maintain the space temperature.

HEATING:
When the thermostat calls for heating, the compressor shall shut down. the gas fired burner will be energized to maintain the room temperature.

25. CONTROLS FOR SERVICE DEPARTMENT, BODY SHOP AND SERVICE RECEPTION EXHAUST

1) Exhaust fan in auto installation area is controlled by interlock with RTU-2. Also c/w a manual switch to turn on and off.
2) Ceiling exhaust fans will be interlock with light switch.
3) Remove gas fired heaters and related parts

26. TESTING AND COMMISIONING

The contractor shall, on the completion of the project, carry out a performance test and commission on the control system to the satisfaction of the engineer and owner.

27. TRAINING

Provide training to the client's operator (minimum 2 days)

ROOF DRAINS

RD-1 Roof drain for sbs with cast aluminum strainer, flashing clamp ring and copper flange.
Watts RD-200-BED

INSULATION SCHEDULE FOR PIPING AND DUCTWORK

TABLE 6.2.4.1.3
MINIMUM PIPE INSULATION THICKNESS[a]

FLUID DESIGN OPERATING TEMPERATURE RANGE, (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE DIAMETER (IN.)				
	CONDUCTIVITY BTU. IN. /(H.FT2. °F)	MEAN RATING TEMPERATURE °F	LESS THAN 1	1 TO <1.5	1.5 TO <4	4 TO <8	8 AND ABOVE
HEATING SYSTEMS (STEAM, STEAM CONDENSATE, AND HOT WATER)[bc]							
ABOVE 350	0.32 – 0.34	250	2.5	3.0	3.0	4.0	4.0
251 – 350	0.29 – 0.32	200	1.5	2.5	3.0	3.0	3.0
201 – 250	0.27 – 0.30	150	1.5	1.5	2.0	2.0	2.0
141 – 200	0.25 – 0.29	125	1.0	1.0	1.0	1.5	1.5
105 – 140	0.24 – 0.28	100	0.5	0.5	1.0	1.0	1.0
DOMESTIC AND SERVICE HOT WATER SYSTEMS							
105 & greater	0.22 – 0.28	100	0.5	0.5	1.0	1.0	1.0
COOLING SYSTEMS (CHILLED WATER, BRINE, AND REFRIGERANT)[d]							
40 – 60	0.22 – 0.28	100	0.5	0.5	1.0	1.0	1.0
Below 40	0.22 – 0.28	100	0.5	1.0	1.0	1.0	1.5

a For insulation outside the stated conductivity range, the minimum thickness (t) shall be determined as follows:

$$T = r\{(1+t/r)^{K/k} - 1\}$$

where T= minimum insulation thickness (in), r = actual outside radius of pipe (in), t = insulation thickness listed in this table for applicable fluid temperature and pipe size, K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature (btu.in.[h.ft2.°f]); and k = the upper value of the conductivity range listed in this table for the applicable fluid temperature.

b These thicknesses are based on energy efficiency considerations only. Additional insulation is sometimes required relative to safety issues/surface temperature.

c Piping insulation is not required between the control valve and coil on run-outs when the control valve is located within 4 ft. of the coil and the pipe size is 1 in or less.

d The thickness is based on energy efficiency considerations only. Issues such as water vapour permeability or surface condensation sometimes require vapour retarders or additional insulation.

TABLE 6.2.4.1.2A
MINIMUM DUCT INSULATION R-VALUE[a] COOLING AND HEATING ONLY SUPPLY DUCTS AND RETURN DUCTS

DUCT LOCATION						
EXTERIOR	VENTILATED ATTIC	UNVENTED ATTIC ABOVE INSULATED CEILING	UNVENTED ATTIC WITH ROOF INSULATION	UNCONDITIONED SPACE[b]	INDIRECTLY CONDITIONED SPACE[c]	BURIED
HEATING DUCTS ONLY						
R-6	R-3.5	NONE	NONE	NONE	NONE	R-3.5
COOLING ONLY DUCTS						
R-1.9	R-1.9	R-1.9	R-1.9	R-1.9	NONE	NONE
RETURN DUCTS						
R-3.5	R-3.5	R-3.5	NONE	NONE	NONE	NONE

a Insulation R-values, measured in (h.ft2.°F)/btu, are for the insulation as installed and do not include film resistance. The required minimum thickness does not consider water vapour transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance is measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 75°F at the installed thickness.

b Includes crawl space, both ventilated and non-ventilated.

c Includes return air plenums with or without exposed roofs above.

TABLE 6.2.4.1.2B
MINIMUM DUCT INSULATION R-VALUE[a] COMBINED HEATING AND COOLING DUCTS

DUCT LOCATION						
EXTERIOR	VENTILATED ATTIC	UNVENTED ATTIC ABOVE INSULATED CEILING	UNVENTED ATTIC WITH ROOF INSULATION	UNCONDITIONED SPACE[b]	INDIRECTLY CONDITIONED SPACE[c]	BURIED
R-6	R-3.5	R-3.5	R-1.9	R-3.5	NONE	R-3.5

a Insulation R-values, measured in (h.ft2.°F)/btu, are for the insulation as installed and do not include film resistance. The required minimum thickness does not consider water vapour transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance is measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 75°F at the installed thickness.

b Includes crawl space, both ventilated and non-ventilated.

c Includes return air plenums with or without exposed roofs above.

EXHAUST FAN SCHEDULE

UNIT TAG	SERVICE	LOCATION	AIR CAP CFM	S.P. "WG	FAN RPM	FAN HP	MOTOR HP (W)	ELECTRICAL V/PH/HZ	SOUND PRESS. SONES	MANUFAC.	MODEL	NOTES 1	2	3
EF- 1	BATHROOM	CEILING	70	0.25	914		(14)	120/1/60	0.3	PANASONIC	FV-08VKM2	•	•	
EF- 2	BATHROOM	CEILING	70	0.25	914		(14)	120/1/60	0.3	PANASONIC	FV-08VKM2	•	•	
EF- 3	AUTO INSTALLATION AREA	ROOF	800	0.5	1302	0.15	0.25	208/1/60	6.9	GREENHEECK	CUBE-101-4			•

NOTES: 1. FAN TO BE C/W BACKDRAFT DAMPER, INLET GRILLE/COLLAR, OUTLET COLLAR, ACCESS PANEL AND DISCONNECT SWITCH.
2. CONTROLLED BY WALL ON/OFF SWITCH BY ELECTRICAL.
3. CONTROLLED BY INTERLOCK WITH RTU-2, DROP DOWN 12"X12" DUCT, SHOULD C/W ROOF CURB, BACKDRAFT DAMPER.

ROOFTOP UNITS

UNIT TAG	SERVICE	LOCATION	EVAPORATOR FAN: AIR CAP CFM	E.S.P. "WG	FAN HP	FAN RPM	COOLING CAPACITY: NET TOTAL MBH	SENSE MBH	ENTERING DB/WB °F	AMB DB °F	HEATING CAPACITY: INPUT MBH	OUTPUT MBH	SEER (EER)	OUTDOOR AIR QTY. CFM	ELECTRICAL: V/PH/HZ	MCA	POWER EXHAUST: FAN HP	FLA	MANU	MODEL	WEIGHT (LB)	NOTES 1	2	3	4	5	6
RTU-1	STORE	ROOF	5000	1.1	5.0	927	150.07	115.98	80/67	95	250/150	203/122	11	1250	208/3/60	64	0.75	6.6	TRANE	YSD150F3RZD	2300	•	•	•	•	•	•
RTU-2	AUDIO AREA, OFFICES	ROOF	3000	1.1	3.0	1224	102.0	86.8	80/67	95	200/140	160/112	11.2	900	208/3/60	44.0	0.75	2.3	TRANE	YSC090E3RZH	1250	•	•	•	•	•	•

NOTES:
1. C/W ROOF CURB, FULL MODULATING ECONOMIZER CONTROL, MOTORIZED OUTSIDE DAMPER, THROUGH THE BASE ELECTRICAL AND CIRCUIT BREAKER DISCONNECT SWITCH, ANTI-CYCLING DEVICES, TWO STAGE STAINLESS STEEL HEAT EXCHANGER, CRANKCASE HEATER, UN-POWERED CONVENIENCE OUTLET, RETURN AIR SMOKE DETECTOR AND DDC CONTROLS
2. EVAPORATOR FAN SHALL BE EQUIPPED WITH BELT DRIVEN BLOWER.
3. UNIT SHALL C/W POWER EXHAUST SYSTEM AND BURGLAR BAR AT SUPPLY AND RETURN OPENINGS.
4. C/W A LOW VOLTAGE MICROELECTRONIC CONTROLLER AND FOUR AVERAGE SENSORS PER UNIT
5. WITH THE TRANE TRACKER PANEL WITH TOUCH SCREEN CONTROL SYSTEM

2013/04/02	ISSUED FOR CONSTRUCTION	3
2013/01/11	ISSUED FOR TENDER	2
2012/12/13	ISSUED FOR BUILDING PERMIT	1
DATE	ISSUE	REV

ARCHITECT

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Member of the SAA
Member of the AAA
Member of the NWTAA

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SEAL

DRAWN BY: TZ
APPROVED: RP

PROJECT
EXISTING BUILDING ALTERATION FOR VISIONS

5756 IMPERIAL STREET
BURNABY, BC

DRAWING
SPECIFICATIONS & SCHEDULES - HVAC

PROJECT NUMBER: D12-035
DRAWING NUMBER: M-4

SCALE: N.T.S
DATE: 2012-12-13