

## MECHANICAL ABBREVIATIONS

& /	AND	HB	HOSE BIBB
ANGLE	HC	HANDICAPPED	
AT	HD	HEAD	
CENTER LINE	HDWE	HARDWARE	
DIAMETER OR ROUND	HORIZ	HORIZONTAL	
EXISTING	HP	HORSEPOWER	
NEW	HW	HOT WATER	
PERPENDICULAR	HWR	HOT WATER RETURN	
POUND OR NUMBER	HWS	HOT WATER SUPPLY	
THERMOSTAT	HVAC	HEATING, VENTILATING, AIR CONDITIONING	
A/C	AIR CONDITIONING	ID	INSIDE DIAMETER (DIM.)
ACCESS PANEL	ABV	INSULATION	INT
ADJUSTABLE	ADJ	INTERIOR	
ADJUSTABLE FINISH FLOOR	AE		
ADJUSTABLE EXTRACTOR	AGGR	LAV	LAVATORY
ALUMINUM	ALUM	LBS	POUNDS
APPROXIMATE	APPT	LPG	LIQUID PETROLEUM GAS
APPOINTMENTS	ARCH.		
ARCHITECTURAL	ARI	MACH	MACHINE
AMERICAN REFRIGERATION INSTITUTE	ASPH	MATL	MATERIAL
ASSISTANT	ASST	MAX	MAXIMUM
AUTOMATIC	AUTO.	MBH	BTU PER HOUR (THOUSANDS)
		MCA	MECHANICAL
		MECH	METAL
BALANCING DAMPER	BDD	MTL	MANUFACTURER
BACKDRAFT DAMPER	(BP)	MH	MANHOLE
BELOW FINISH FLOOR	(BO)	MIN	MINIMUM
BELOW FINISH GRADE	BLDG	MISC	MISCELLANEOUS
BUILDING	BLKG	MUA	MAKE UP AIR
BLOCKING	BM		
BEAM	BTUH		
BRITISH THERMAL UNIT/ HOUR	BOT	(N)	NEW
BOTTOM	BP	NIC	NOT IN CONTRACT
BY-PASS TIMER		NO. or #	NUMBER
		NOM	NOMINAL
		NTS	NOT TO SCALE
CA	COMBUSTION AIR		
CAP	CAPACITY		
CONDENSATE DRAIN	CD	OA	OVERALL
CEILING FIRE DAMPER	CFD	OB	OPPOSED BLADE DAMPER
CUBIC FEET PER MINUTE	CFM	OC	ON CENTER
CHILLED WATER	CHW	OSA	OUTSIDE AIR
CHILLED WATER RETURN	CHWR	OVHD	OVERHEAD
CHILLED WATER SUPPLY	CHWS		
CONTROL JOINT	CJ		
CEILING	CLG	PTN	PARTITION
CAULKING	CLR	PHYS	PHYSICAL
CLEAR	CO	PR	PRESSURE RELIEF
CLEANOUT	COLUM	PVC	POLY-VINYL CHLORIDE PIPE
COLUMN	COMP	PLAS	PLASTER
COMPRESSED	CONC	PLYWD	PLYWOOD
CONCRETE	CONF	POC	POINT OF CONNECTION
CONFERENCE	CONN	PREFAB	PREFABRICATED
CONNECTION	CONST	PREP	PREPARATION
CONSTRUCTION	CONT	PSI	POUNDS PER SQUARE INCH
CONTINUOUS	CORR	PW	PROCESSED WATER
CORRIDOR	CSE		
CALIFORNIA SEASONAL EFFICIENCY	CKS	R	RISER
COUNTERSUNK	CTR	RA	RETURN AIR
CENTER	CV	RAD.	RADIUS
CHECK VALVE		RAG	RETURN AIR GRILLE
		REF	REFERENCE
		REIN	REINFORCED
		REQD	REQUIRED
		RM	ROOM
		RND	ROUND
DBL	DOUBLE		
DRY BUILD (TEMPERATURE)	DEPT		
DEPARTMENT	DET		
DETAIL	DHW		
DRINKING FOUNTAIN	DIA or Ø		
DOMESTIC HOT WATER	DIAMETER		
DOMESTIC HOT WATER RETURN	DIR		
	DIRECTOR		
	DN		
	DOWN		
	DR		
	DOOR		
	DS		
	DOWNSPOUT		
	DSP		
	DRY STANDPIPE		
	DTR		
	DUCT THRU ROOF		
	DTW		
	DUCT THRU WALL		
	DWG		
	DRAWING		
E	EAST		
EA	EXHAUST AIR		
EAG	EXHAUST AIR GRILLE		
EDB	ENTERING DRY BULB		
EER	ENERGY EFFICIENCY RATIO		
ELEC	ELECTRICAL		
ELEV	ELEVATION		
EMER	EMERGENCY		
ENCL	ENCLOSURE		
EP	ELECTRICAL PANEL		
EQ	EQUAL		
EQUIP	EQUIPMENT		
(E)	EXISTING		
ESP	EXTERNAL STATIC PRESSURE		
EWB	ENTERING WET BULB		
EXPO.	EXPOSED		
EXT	EXTERIOR		
FA	FIRE ALARM		
FC	FLEXIBLE CONNECTION		
FD	FIRE DAMPER		
FDN	FOUNDATION		
FE	FIRE EXTINGUISHER		
FEC	FIRE EXTINGUISHER CABINET		
FHC	FIRE HOSE CAB.		
FHMS	FLAT HEAD METAL SCREW		
FIN.	FINISH		
FLA	FULL LOAD AMPS		
FLASH.	FLASHING		
FM	FIRE MAIN		
FOC	FACE OF CONCRETE		
FOF	FACE OF FINISH		
FPM	FEET PER MINUTE		
FRPF	FIREPROOFING		
FSC	FAN SPEED CONTROL		
FSD	FIRE/SMOKE DAMPER		
FSL	FIRE SPRINKLER LINE		
FTR	FLUE THRU ROOF		
FUNC	FUNCTION		
FURR	FURRING		
FUT	FUTURE		
GA	GAUGE OR GAGE		
GALV	GALVANIZED		
GEN	GENERAL		
GL	GALVANIZED IRON		
GL	GLASS		
GPM	GALLONS PER MINUTE		
GR	GRADE		
GRD	GROUND		
G	GAS LINE		

## SYMBOLS

SYMBOL	DESCRIPTION
	AIR CONDITION UNIT
	SUPPLY AIR CEILING DIFFUSER
	SUPPLY AIR CEILING DIFFUSER
	SUPPLY VARIABLE AIR CEILING DIFFUSER HEAT & COOL
	RETURN AIR CEILING REGISTER
	EXHAUST AIR CEILING REGISTER
	SUPPLY AIR WALL DIFFUSER
	RETURN AIR WALL REGISTER
	EXHAUST AIR WALL REGISTER
	TRANSFER GRILLE
	DUCTWORK (RECTANGULAR)
	DUCTWORK (ROUND)
	LINED DUCTWORK
	TURNIG VANE
	FLEXIBLE DUCTWORK
	FLEXIBLE CONNECTION
	MANUAL AIR VOLUME DAMPER
	FIRE DAMPER
	SMOKE FIRE DAMPER
	OUTSIDE AIR INTAKE
	ROOM THERMOSTAT - SUBSCRIPT INDICATES UNIT CONTROL
	BYPASS TIMER
	TIME CLOCK
	ON/OFF SWITCH
	FAN SPEED CONTROL
	DUCT SMOKE DETECTOR
	POINT OF CONNECTION
	CEILING EXHAUST FAN
	FURNACE (VERTICAL)
	FURNACE (HORIZONTAL)
	CONDENSING UNIT

## GENERAL MECHANICAL NOTES

SECTION 1  
BASIC MECHANICAL MATERIALS AND METHODS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Labor, materials, tools, and services for a complete installation of equipment and system contained in the Contract Documents.
- B. Principal features of the work included are:
1. Heating, ventilating, air conditioning systems, controls, and mechanical system insulation.
  2. Roof curbs for HVAC systems, intake hoods, louvers, supply fans, and relief vents furnished and set under this Division.
  3. Refrigerant piping, connections, refrigerant and refrigerant charges.
  4. Excavating and backfilling for mechanical work; coordinate with appropriate trade.
  5. Anchor bolts, sleeves, supports and similar items to be built into concrete or masonry.
  6. Preparation for testing and balance of mechanical systems and correcting deficiencies.
  7. Preparation and submittal of shop drawing and product data.
  8. Maintaining a record set of blue line prints and making them to indicate locations of concealed items, and deviations made to suit conditions and production of mechanical as-built (record) drawings.

- 1.2 JOB CONDITIONS.
- A. Submittal of bid implies bidder has read applicable paragraphs of the specifications and will be bound by their conditions.
- 1.3 LOCAL CONDITIONS
- A. Conform with local conditions. Coordinate with local utilities on size of utility service.
- 1.4 INTENT
- A. The contract documents (drawings and specifications) describe the mechanical work of this project any items mentioned in one part shall be as binding as though mentioned in both.
- B. The contract documents form a guide for a complete mechanical installation. Where an item is reasonably necessary but not specifically mentioned, such as duct hangers or transitions, piping offsets, drains, etc., for a complete system, provide same.
- C. Mechanical layouts indicated on drawings are diagrammatic only. Exact locations of ducts, and equipment shall be governed by the drawings of related trades.

- 1.5 DEVIATIONS
- A. No deviations from specifications and drawings shall be made without full knowledge and written consent of Construction Manager.
- B. Should Contractor find, during progress of work, conditions which dictate a modification of any particular requirements, report such item promptly for decision of instructions.

- 1.6 QUALITY ASSURANCE
- A. Comply with applicable local, state and federal codes.
- B. Comply with applicable requirements of recognized industry associations with promulgate standards for the various trades. ( see individual sections of division 15 )
- C. Employ only qualified journeymen for this work. Employ competent, qualified mechanics to supervise the work.

- 1.7 CODES AND STANDARDS
- A. Perform work specified in Division 15 in accordance with the applicable codes and standards listed below, and such standards that may be specified in other sections, when these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Mechanical Engineer.
1. NFPA 54: National Fuel and Gas Code.
  2. NFPA 90A: Fire Protection and Ventilation Systems.
  3. NFPA 101: Life Safety Code.
  4. Applicable State Building Code.
  5. Applicable State Mechanical Code.
  6. Handicapped Code ANSI A117.1 and ADA
  7. Applicable State Energy Code.
  8. AGA: American Gas Association.
  9. ANSI: American National Standards Institute.
  10. ARI: American Refrigeration Institute.
  11. ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers.
  12. ASME: American Society for Mechanical Engineers.
  13. ASTM: American Society for Testing and Materials.
  14. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry.
  15. NFPA: National Fire Protection Association.
  16. SMACNA: Sheet Metal and Air Conditioning Contractor's National Association.
  17. UL: Underwriters Laboratories, Inc.

- 1.8 COORDINATION
- A. Carefully examine specifications and drawings to be thoroughly familiar with items which require HVAC connections and coordination.
- B. Coordinate with other Divisions to leave proper chases and openings, place outlets, anchors, sleeves, and supports prior to pouring concrete of installation of masonry work.

- 1.9 SUBMITTALS
- A. Submittals are only required for specific items of equipment or material listed in individual sections of these specifications.
- B. Within 15 days after award of contract for this work, submit a list of proposed manufacturers (of equipment or material to be used) for approval. Submit this list before submittal of shop drawings and product data, and obtain approval before submitting required items.
- C. Shop Drawings (not required for Owner furnished equipment).

- 1.10 DELIVERY AND STORAGE
- A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where that is not practical, cover items with protective materials to keep them from being damaged. Use care in loading, transport, unloading, and storage to keep items from being damaged.

- 1.11 FIRE RATINGS
- A. Materials used anywhere in the work must have NFPA ratings as following:
1. flame spread - not over 25
  2. smoke developed - not over 50
  3. fuel contributed - not over 25
- B. Materials shall be "self Extinguishing".

- 1.12 PERMITS AND FEES
- A. Obtain, pay for, and deliver permits, certification of inspection, and other such items required by the authorities having jurisdiction. Deliver certification to the Construction Manager prior to Final Acceptance of the work. An inspection certificate for each class of work requiring inspection must be submitted prior to or with the final payment invoice. The responsible Trade Contractor must make application for the inspection, coordinate same and pay the required inspection fee.

- 1.13 EXTENDED WARRANTIES
- A. Work furnished under the Contract shall be warranted against defects in workmanship and ( Contractor furnished) materials for a period of not less than one (1) year, or as otherwise specified, from the date of final acceptance of the installation. Defects of workmanship developing during this period shall be remedied, and defective material replaced, without additional cost. When defects in a Trade Contractor's work causes damage to the work of the other Trade Contractors, such damage shall be repaired by the Trade Contractor causing damage and work restored to its original condition, at the expense of the Trade Contractor that caused the damage.

## PART 2 - PRODUCTS

## 2.1 MATERIALS AND EQUIPMENT

- A. Within the Contract Documents relating to mechanical work, manufacturer's names, catalog numbers, and other proprietary references to materials and equipment are made. Such references are made to establish the standards of quality and type required, and not to limit competition. Acceptable manufacturer's of competitive products are listed in applicable sections as "approved equals". Reasonable requests for substitution or additions to "approved equals" will be considered, but the Mechanical Engineer will be the sole judge of acceptability of items proposed as substitutes.
- B. materials and equipment used in carrying out these specifications shall bear UL or other recognized testing laboratory label when such labels are available.

## PART 3 - EXECUTION

## 3.1 LOCATIONS

- A. Mechanical layouts indicated on drawings are diagrammatic. Exact locations of duct, and equipment may vary because of conflicts with work of other trades. Work out conflicts where relocation's will not affect operation or appearance of systems.
- B. Locate equipment requiring periodic servicing so that it is readily accessible. Do not back up service sides to walls, nor place it too close to other equipment to make service impractical. Equipment service clearance shall meet minimum acceptable distance as recommended by equipment manufacturer.

## 3.2 UTILITIES EXCAVATING AND BACKFILLING

- A. Perform trenching, excavating, backfilling for mechanical work in accordance with the appropriate sections and as set forth below
1. perform work necessary for installation of mechanical utilities.
  2. Depth of excavation to provide a minimum of 3' above top of pipe. Excavation to be carried to a depth of at least 6" below bottom of pipe elevation. Fill below pipe (6") around pipe, and a minimum of 12" above pipe with sand or class "B" crushed stone tamped firm and even.

- Separate topsoil during excavation. Final layer of dirt (12" minimum) to be topsoil. Trenches to be at least 18" wider than pipe with batter boards placed every 25'. Backfilling shall be done to exclude use of rock or stone above sand or crushed stone.

## 3.3 CUTTING AND PATCHING

- A. Repair or replace routine damage caused by cutting in performance of contract.
- B. Correct unnecessary damage caused due to installation of mechanical work.
- C. Perform repairs with materials which match existing and install in accordance with the appropriate section of these specifications or the best standards of the industry.

## 3.4 CONNECTION TO EQUIPMENT

- A. Connect or install equipment shown on mechanical drawings that require mechanical hookups.
- 3.5 SERVICE OF EQUIPMENT
- A. If equipment is placed in service prior to acceptance of the project, operate equipment strictly in accordance with manufacturer's instructions. Install new filters in equipment prior to owner occupying building.
- B. Employ competent, qualified personnel in operation of the equipment.
- C. Perform repairs with materials which match existing and install in accordance with the appropriate section of these specifications or the best standards of the industry.
- D. Open up equipment for inspection as directed by the Superintendent.
- E. Lubricate equipment and perform such other maintenance as required to place it in first class operating condition.

- END OF SECTION
- SECTION 3  
HEATING, VENTILATION AND AIR CONDITIONING

## PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS
- A. Refer to drawings and Contract for materials furnished by Owner, installed by Contractor or furnished and installed by Owner.

## 1.2 SCOPE OF WORK

- A. Furnish all labor, supervision, and equipment ( unless equipment is specifically noted as 'Owner furnished' ) for the complete installation of heating, ventilation, and air conditioning system together with all necessary auxiliaries and appurtenances.

## 1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications - install packaged units, as indicated in the Drawings, in accordance with manufacturer's instructions and requirements. Provide related products and accessories from one manufacturer. Store materials in accordance with manufacturer's recommendation protecting from dirt, moisture, contaminants, and weather.
- B. Codes and standards - Perform all installation in accordance with the latest standards as recognized by ASHRAE, SMACNA and all applicable state and local codes and ordinances.
- C. Workmanship - Experienced, well - trained workers, competent to complete the work as specified, shall perform Labor in conformance with generally accepted trade standards. Install all equipment square and plumb allowing access for proper operation, adjustment and service.

## 1.4 STRUCTURAL AND SPACE CONDITIONS

- A. All work shall avoid obstructions and interference with other trades, preserve headroom and keep openings and passageways clear and free.

## 1.5 VIBRATION AND NOISE

- A. Install each of the various pieces of equipment to operate without objectionable vibration or noise.

## 1.6 CUTTING AND PATCHING

- A. Cutting or patching necessary to permit the installation of any work under this contract shall be the responsibility of this trade. Cutting and patching shall be coordinated with other trades so as not to impact other work

## 1.7 BALANCING AND TESTING

- A. Test and Balance shall be performed by a nationally qualified Test and Balance Company. Balance company shall be an NEBB company.
- B. Contractor shall coordinate testing with the Testing and Balance Company. All systems shall be fully operational prior to commencement of testing. Correct all deficiencies noted in the Test and Balance Report within three days or prior to acceptance of the project.
- C. Assume responsibility for correcting all items determined to be the result of improper or incomplete installation. Extra testing required due to such deficiencies will be at contractor's expense.
- D. Contractor shall be responsible for providing test reports to the local Building and Health Departments as required for Certificate of Occupancy.

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## PART 2 - PRODUCTS

## 2.1 AIR CONDITIONING UNITS, FANS AND AIR DEVICES

- A. Shall be as indicated on the Drawings.

## 2.2 DUCTWORK

- A. Rectangular Duct Fabrication, General - Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA - HVAC Duct Construction Standards, Tables 1 - 3 through 1 - 19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.

## 2.3 DUCT ACCESS PANELS AND DOORS

- A. In sheet metal work, hollow core double construction of same or heavier gage material as duct in which installed, products by CESCO, Vent Products, Air Balance, or equivalent.
1. Provide Ventlok or approved hinges and latches on all doors; 100 series hinges and latches on low pressure system doors up to 18" maximum dimension, 200 series on larger low pressure system doors and 333 series on high pressure systems.
2. Construct doors up to 18" maximum dimension with one inch overlap fit and gasket with 3/4" by 1/8" sponge rubber, fit larger doors again 1-1/2" by 1/8" flat stock or angle frame and gasket with 3/4" by 1/8" sponge rubber or felt
3. Door swing to be opposite of airflow.

## 2.4 DUCTWORK SPECIALTIES

- A. Volume and Splitter Dampers
1. Galvanized sheet metal blade and frame with Ventlok operating hardware.
  2. For accessible dampers, provide #641 self - locking dial regulators and #644 self - locking dial regulators for insulated ductwork, #637 square end bearing, and #635 spring end bearing, as applicable
  3. For inaccessible dampers, provide #666 or #667 concealed locking damper regulator with bearing as above. For static pressures above 3" W.G., provide #640 Hvel dial regulator and #609 Hvel end bearing for accessible dampers.

- B. Multi - Louver Volume Dampers
1. 16 - gauge galvanized steel frame. Opposed, 6" wide, 16 - gauge galvanized steel blades. Concealed linkage in frame.
  2. Titus #AG - 35 - B, Ruskin #CD35/ OBD or equal

- C. Flexible Connections
1. Provide flexible connectors at the discharge and inlet of fans, air handlers, rotating mechanical equipment, and where shown on the Drawings for proper vibration isolation.
  2. Neoprene impregnated glass cloth with 24 - gauge galvanized metal frame. Minimum dimensions - 3" metal, 3" fabric, 3" metal.
  3. Duro Dyne #MFNA, Vent fabrics #Ventglas, Q Industries, consolidated