APPLICATION TIPS

North America Commercial Systems

Date	Subject	Department
7/21/2021	**19MV Carrier Specifications**	**Chiller Product Marketing**
Bulletin Number	**Product Model Number(s)**	**Author Name/Phone/Email**
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19MV Carrier Specifications

Most times, consultants will not substitute their entire specifications section for our guide specification. Therefore, below are key phrases that should be placed into the engineer's existing specifications in the appropriate section.

Compressor Stages (02/21)

By leveraging an inter-stage flash economizer, Carrier has improved refrigeration cycle efficiency, reducing compressor power while simultaneously increasing refrigeration effect and capacity. This leads to high efficiency at highly loaded conditions. In addition to expanding our operating envelope to better position ourselves for high tonnage/high lift applications, Carrier's two-stage compressors offer the same advantages as our single stage compressors:

1. **Semi-Hermetic Magnetic Motor:** Semi-hermetic magnetic motor rejects no heat to the mechanical space (eliminates need for additional cooling). When competing against York YK chillers, make sure the additional cooling required to offset the motor heat is included. For a 2,000 Ton (7,034 kW) chiller, the motor heat rejection accounts for about 17 additional tons (60 kW) of required cooling. This also means additional ductwork, piping, installation costs, controls integration, etc.

   Example:

$$Chiller\ Load = 2{,}000\ tons$$
$$Chiller\ Efficiency = 0.6kW/ton$$
$$Motor\ Efficiency = 0.95$$

$$Chiller\ Power\ Consumption = \frac{0.6kW}{ton} * 2{,}000\ tons = 1{,}200\ kW$$

$$Motor\ Horsepower = \frac{Chiller\ Power\ Consumption}{0.7457} = 1{,}609\ hp$$

$$Motor\ Loss = 1 - Motor\ Efficiency = 0.05$$

$$Motor\ Horsepower\ Loss = Motor\ Horsepower * Motor\ Loss = 0.05 * 1{,}609\ hp = 80.5\ hp$$

$$Motor\ Cooling\ Load = Motor\ Horsepower\ Loss * \frac{2{,}544\ BTU}{hp} * hr = 80.5\ hp * 2{,}544 \frac{BTU}{hp} * hr = 204{,}792\ BTUh$$

$$Motor\ Cooling\ Load = \frac{204{,}792\ BTUh}{12{,}000\ ton} = \mathbf{17.1\ tons}$$

2. **No Shaft Seals:** No refrigerant/oil loss associated with shaft seals. York's open drive motor seals can lose up to 2% of the total chiller refrigerant charge annually. This equates to half of the initial charge over the lifetime of the chiller. Typically, an open motor shaft seal must be replaced every 3-5 years at a cost of $3,000-$5,000 for each compressor
3. **Motor Operating Environment:** No exposure to outside contaminants which can shorten motor life. See item 1 in "Semi-Hermetic Motor" section above.
4. **Variable Orifice Metering Device:** Variable orifice refrigerant flow controller optimizes refrigerant levels independent of load and lift. Trane CVH chillers utilize a fixed orifice refrigerant metering device. Because the size of the orifice is designed for full load and full lift conditions there is a higher required differential pressure between the evaporator and condenser. Trane chillers therefore cannot run with as cold condenser water as Carrier chillers can.
5. **Cold Condenser Water Operation:** Energy saving cold condenser water operation down to 1-2F (0.5-1.1C) of lift. See "**Know Your Competition – Trane Cold Condenser Water Operation**" product bulletin for more detailed information**.**

Wide Operating Envelope (08/21)

Due to the EquiDrive™ back-to-back compressor design, Carrier has the unique capability to provide more operating range while maintaining competitive efficiency at design conditions. It is recommended to write into a specification that the chiller shall exceed ASHRAE 90.1 Efficiencies at AHRI 550/590 or 551/591 conditions and be capable of operating at 95F (35C) ECdWT with down to minimum load without the use of hot gas bypass with an identical chiller model number.

Be sure to verify the capabilities of the chiller selection in eCat.

Low Lift Operation (08/21)

The 19MV is suitable for operation with 1-2F (0.5-1.1C) difference between the leaving condenser water temperature (LCdWT) and leaving chilled water temperature (LCWT) as standard.

Magnetic Levitation System (08/21)

To ensure a simple solution with a wide operating envelope, refrigerant or ceramic bearings shall be utilized in the compressor. Utilized in conjunction with a back-to-back two-stage compressor arrangement, it will ensure proper load cancellation and result in a bearing life that lasts the life of the chiller. No scheduled teardowns or inspections will be required.

Compressor Speed (08/21)

Compared to other oil-free compressors, the 19MV runs at a lower speed, typically around 3-6 times slower (please see the *19MV Compressor Information* application tip for 19MV compressor speeds). A good specification comment to add to benefit the 19MV would be as follows:

1. Oil-free compressor shall operate with a speed of less than 15,000 rpm. If the compressor speed exceeds this rpm, an extended compressor/motor warranty shall be provided based upon the RPM of the compressor as follows:
    - Compressor RPM Warranty Term
        - 0-15,000 rpm - 1 year from start-up
        - Above 15,001-Up - 10 years from start-up

Open Drive Chillers (08/21)

1. Chillers utilizing open drive with ODP motors shall have included in the bid price, the price of:

   A. Cleaning of air filters and passages quarterly (per motor manufacturers' recommendations) for a period of 5 years. Rotor ends, windings, and fan blade passages shall be inspected and cleaned semiannually (per motor manufacturers' recommendations) for a period of 5 years.
   B. Replacement of any shaft seals that may be leaking.
   C. Replacement and reclamation of oil and refrigerant that may have leaked out from the seal. All parts and labor shall be included for a period of 5 years. An annual inspection shall be performed, and a report shall be furnished to the owner regarding the above.

2. Compressor motor shall be of the hermetic, liquid refrigerant cooled, squirrel cage, induction type suitable for voltage shown on the equipment schedule. If an open drive compressor is used, then a Totally Enclosed Water to Air Cooled Motor (TEWAC) shall be used to prevent motor heat being released into the mechanical room. In addition, the manufacturer shall provide a five-year parts and labor warranty on the coupling and against shaft seal leakage. Contractor shall include all piping, valves, thermometers and valved bypass, etc. in the base bid.

   See "**TEWAC Motor Specification**" in **LIBRARY** of the *NG eCat* selection program.

3. If open drive chiller is utilized, then the contractor shall provide additional cooling for the mechanical room. The cooling capacity of the additional unit shall be 5% minimum of the chiller motor's total rated input kW. Contractor shall be responsible for the design and installation of the unit. Include all auxiliary piping, ductwork, controls (integration into building's BMS), etc. The design and the cooling unit shall be submitted for approval.

$$cfm = \frac{(Full\ Load\ Motor\ kW) * (0.05) * (3413)}{(104 - 95) * (1.08)}$$

4. The chiller shall have a 5-year refrigerant warranty against leaks of over 0.1% of the original refrigerant charge. Owner shall have the option to extend coverage of the refrigerant warranty for the entire life of the chiller.

Refrigerants (08/21)

The following low GWP refrigerants are considered acceptable:

- HFO-1233zd(E), low pressure, GWP = 1.34
- HFO-514A, low pressure, GWP = 3.71
- HFO-513A, medium pressure, GWP = <600
- HFC-134a

a. HCFC-123 is not acceptable. If the manufacturer is unable to offer HFO-514A at the time of the bid submission, the manufacturer shall include a line item price in their bid to retrofit the chillers with HFO-514A (including the refrigerant, using factory service labor) within two years of issuance of the purchase order. In addition, the performance shall be adjusted by 2% at full and part load to reflect the impact of the refrigerant change into existing equipment.
b. If a B1 refrigerant is being offered, a vapor activated alarm system shall be capable of responding to levels of 10 ppm (HCFC-123) or (50 ppm (HFO-514A) Allowable Exposure Limit (AEL). Plant room ventilation is required.

HCFC-123 Chillers (08/21)

Manufacturers proposing chillers that utilize HCFC-123 shall include (with their quotation) a warranty for availability and pricing of HCFC-123 for a period of 25 years to protect the owner from unacceptable price increases as HCFC refrigerants are phased out. The contractor shall submit the proposed pricing and availability of HCFC-123 to the owner for approval prior to selecting a supplier for the chillers

Variable Frequency Drives (08/21)

The unit mounted variable frequency drive shall be air-cooled and totally enclosed. System water-cooled VFD's shall be provided with a cleanable plate & frame type heat exchanger to discourage the buildup of deposits from condenser water.

Variable frequency drive shall meet a 5% impedance and 100kAIC SCCR rating as standard.

A field installed harmonic filter is available as an option.