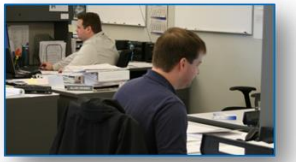
Kelvion

Ian Hemingway
Regional Sales Manager

GASKETED PLATE HEAT EXCHANGERS FOR HVAC APPLICATIONS

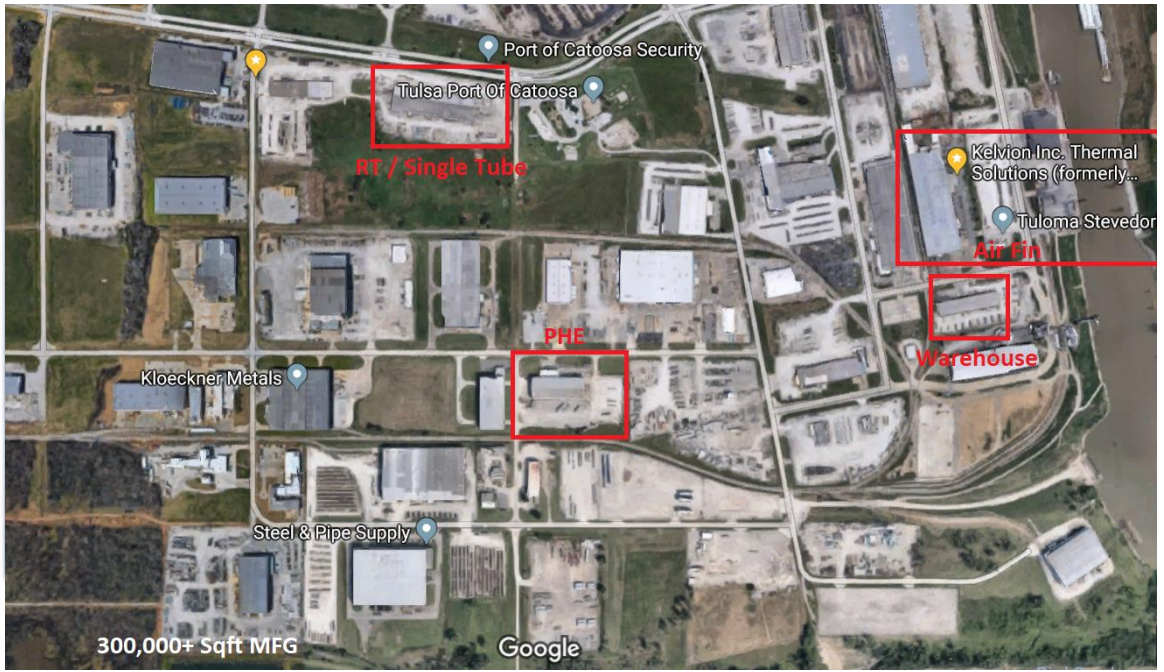
Kelvion – Catoosa, OK

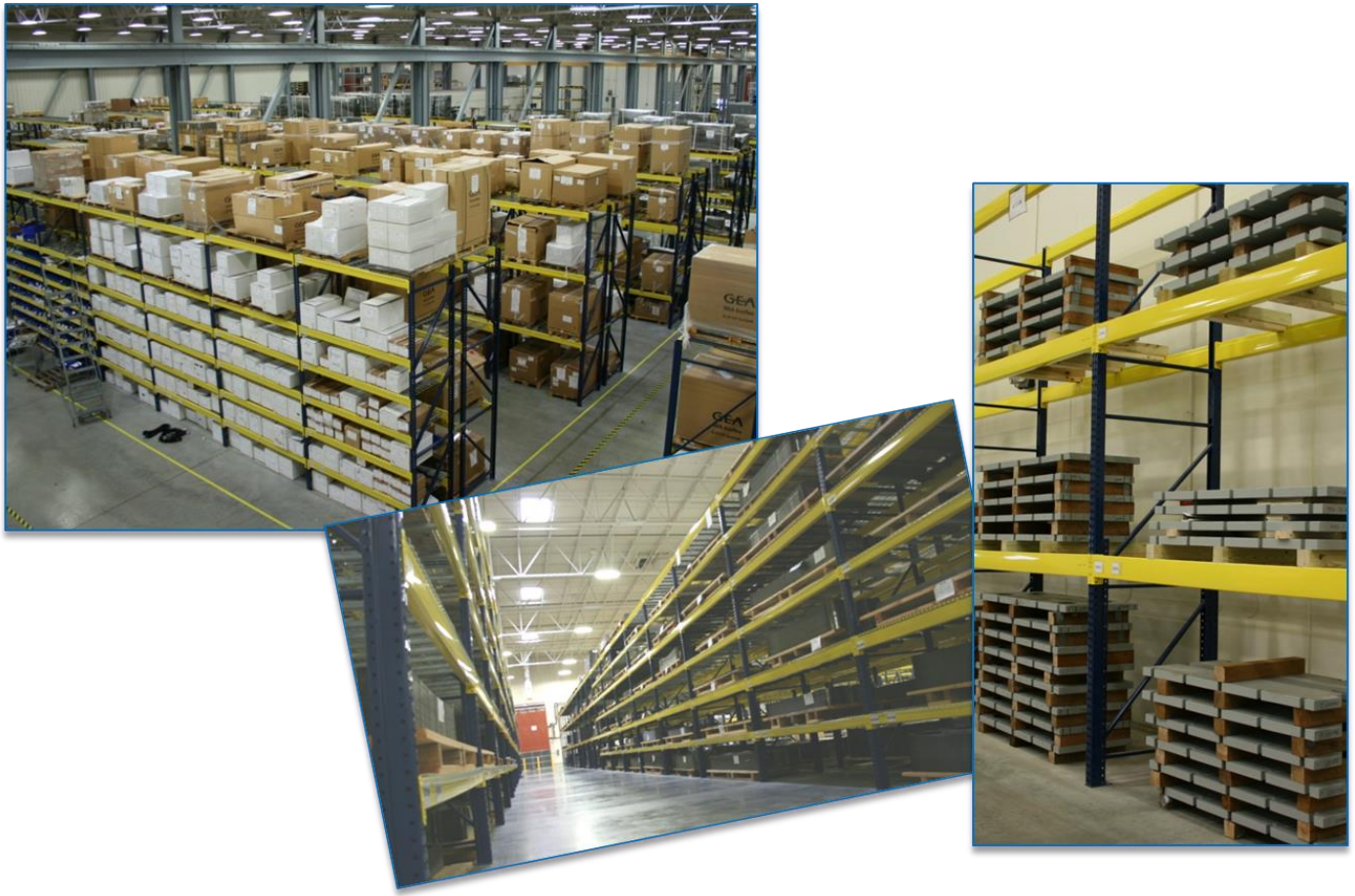
Application Engineering



Customer Service

Manufacturing





Brazed

-Pressures to 650+ psig

-Temperatures to 1000°F

-Flow rates to ~800 gpm

Sanitary

-Meets 3A Sanitary Standards

-Available with auto Open/Close

-Stainless Steel Cladded

Gasketed

-Pressures to 450+ psig

-Temperatures to 370°F

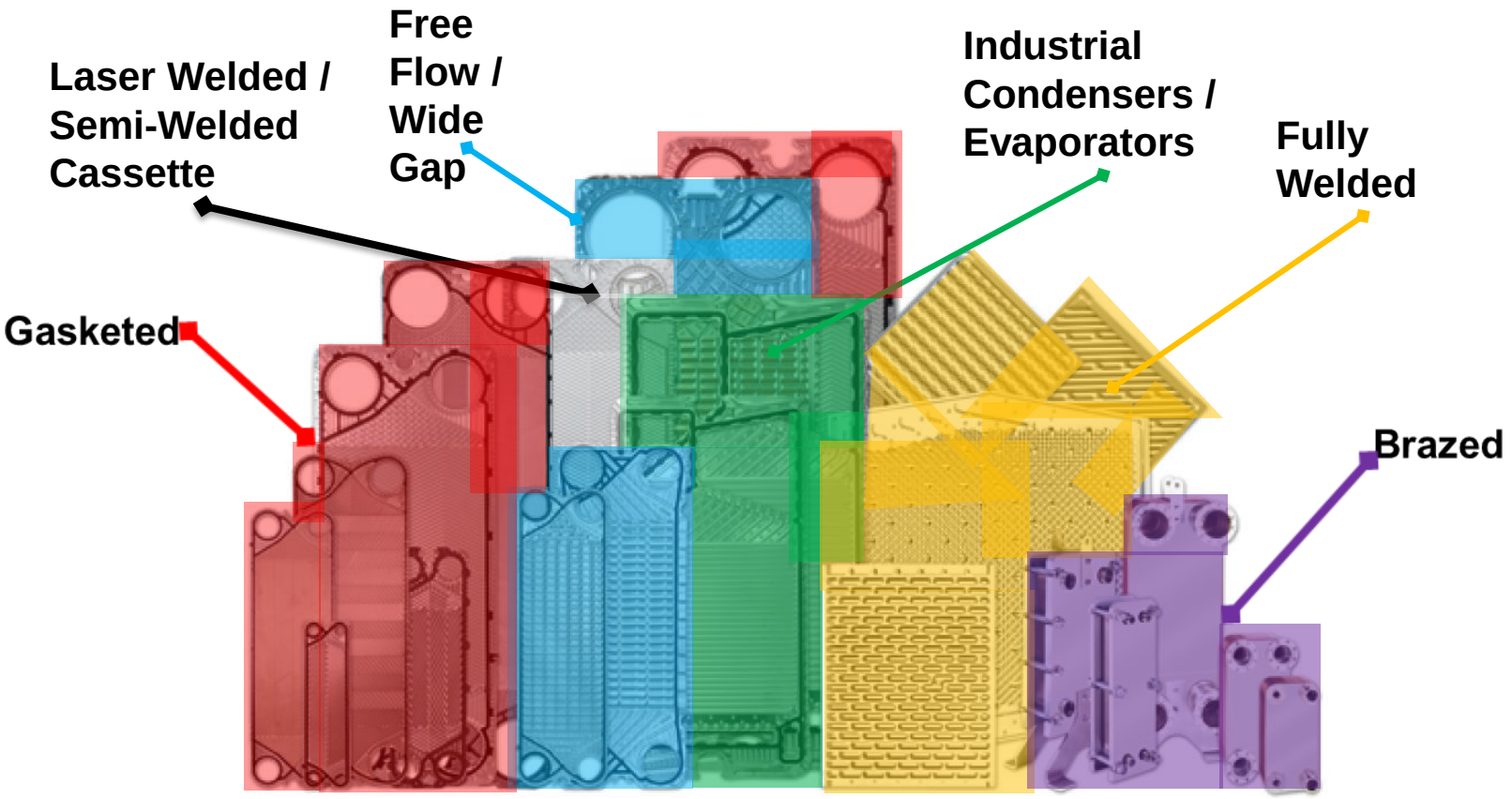
-Flow Rates to ~20,000 gpm

Welded

-Pressures to 450+ psig

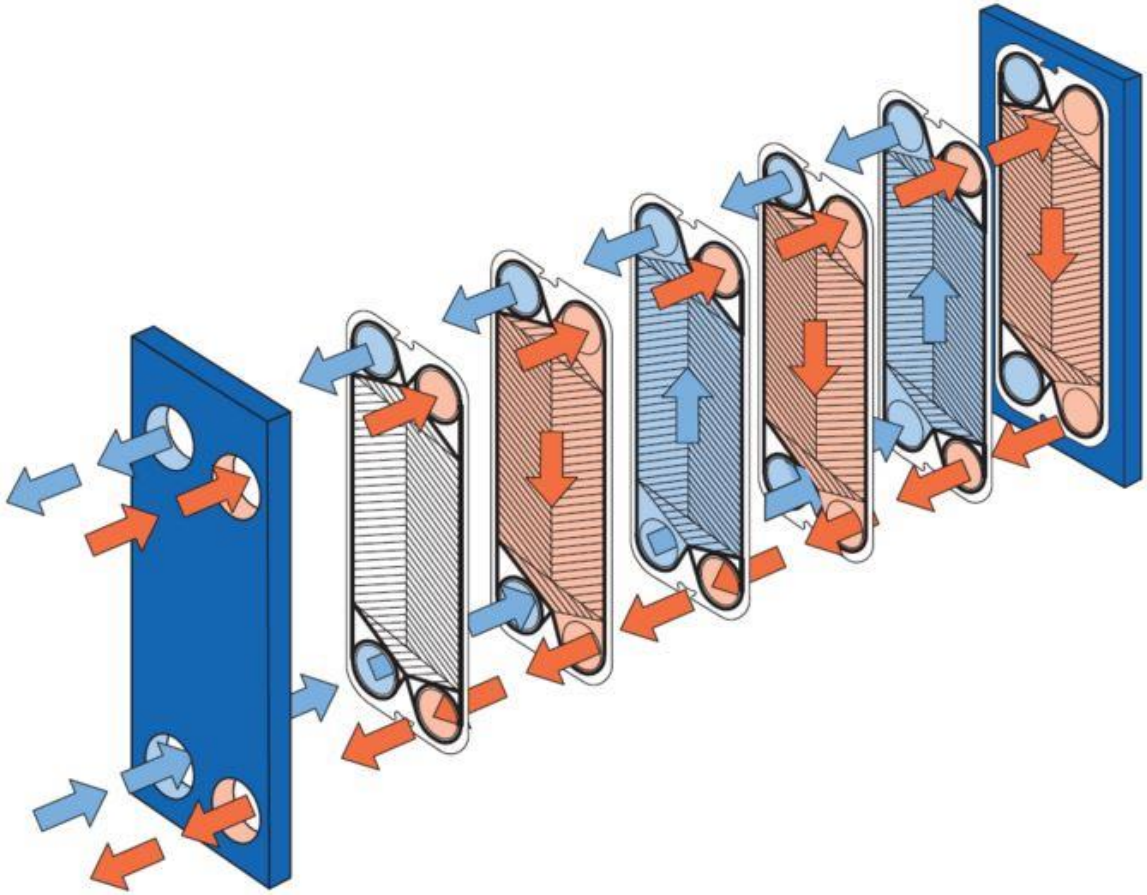
-Temperatures to 550°F

-Flow Rates to ~30,000 gpm


Laser Welded / Semi-Welded Cassette
Free Flow / Wide Gap
Industrial Condensers / Evaporators
Fully Welded
Gasketed
Brazed

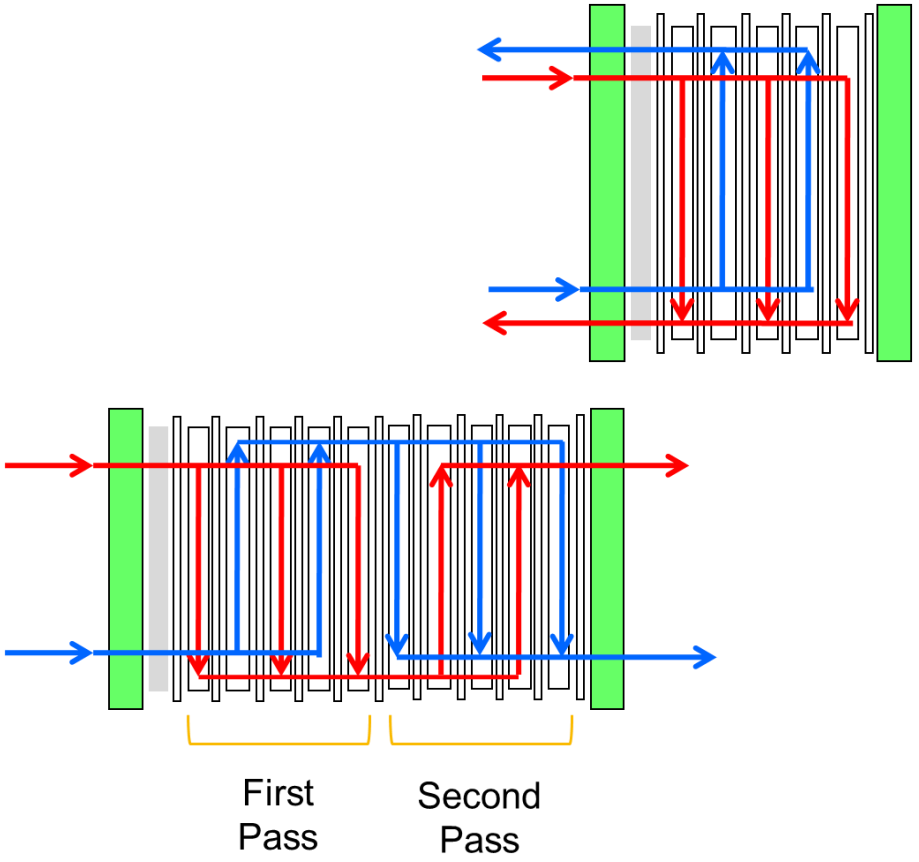
- Up to 20” connections
- >20,000 GPM

Gasketed Plate Heat Exchangers Terminology & Technology

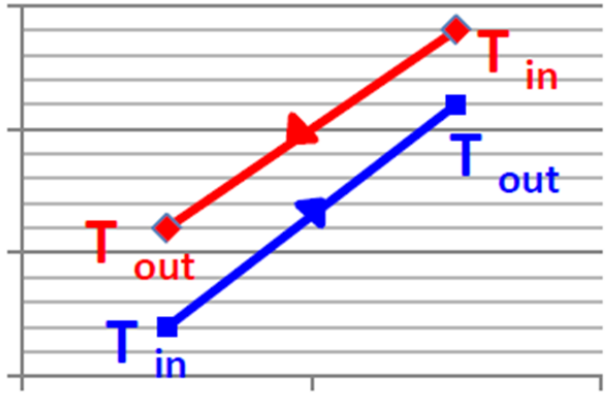


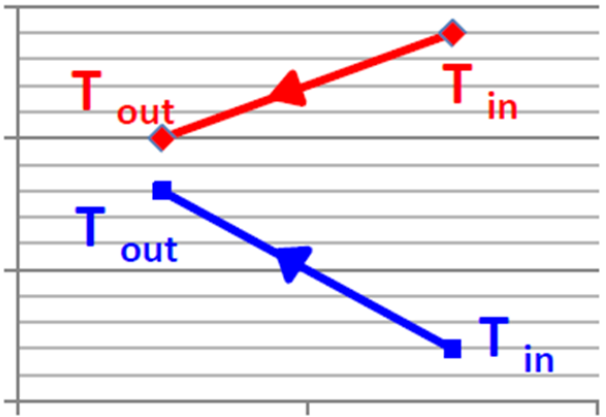
- Single Pass Designs: The two fluids pass each other only once within the PHE.

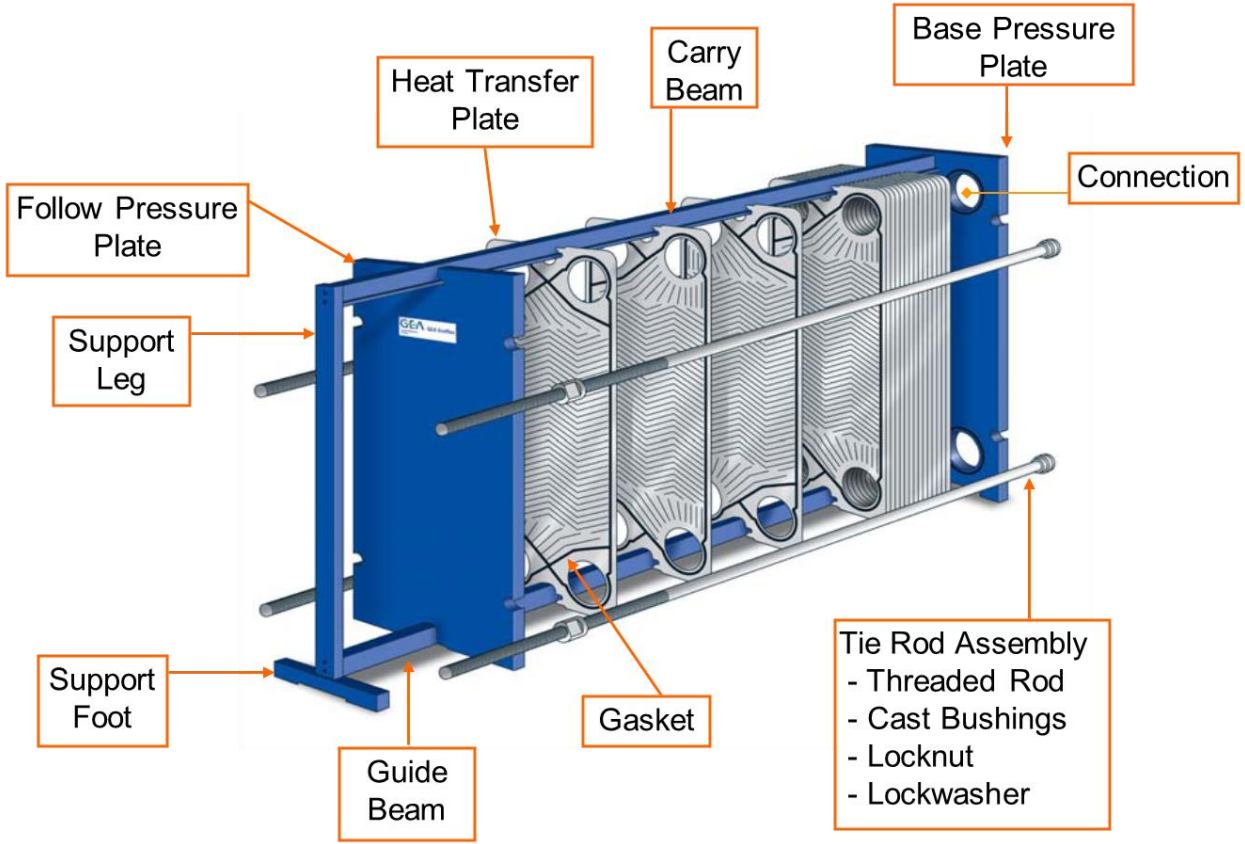
- Multi Pass Designs: The two fluids pass each other multiple times within the PHE.



- **Piped in Counter Flow**
  - Very close approach temperature
  - Makes full use of PHE's efficiency advantage
- **Piped in Cocurrent Flow**
  - Close approach temperature not possible





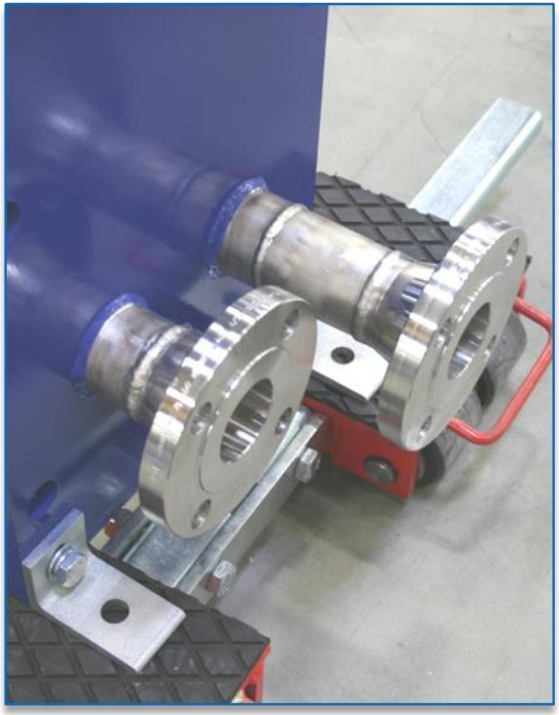

Base Pressure Plate
Carry Beam
Heat Transfer Plate
Connection
Follow Pressure Plate
Support Leg
Support Foot
Guide Beam
Gasket
Tie Rod Assembly
- Threaded Rod
- Cast Bushings
- Locknut
- Lockwasher

Unlined

Metal Lined

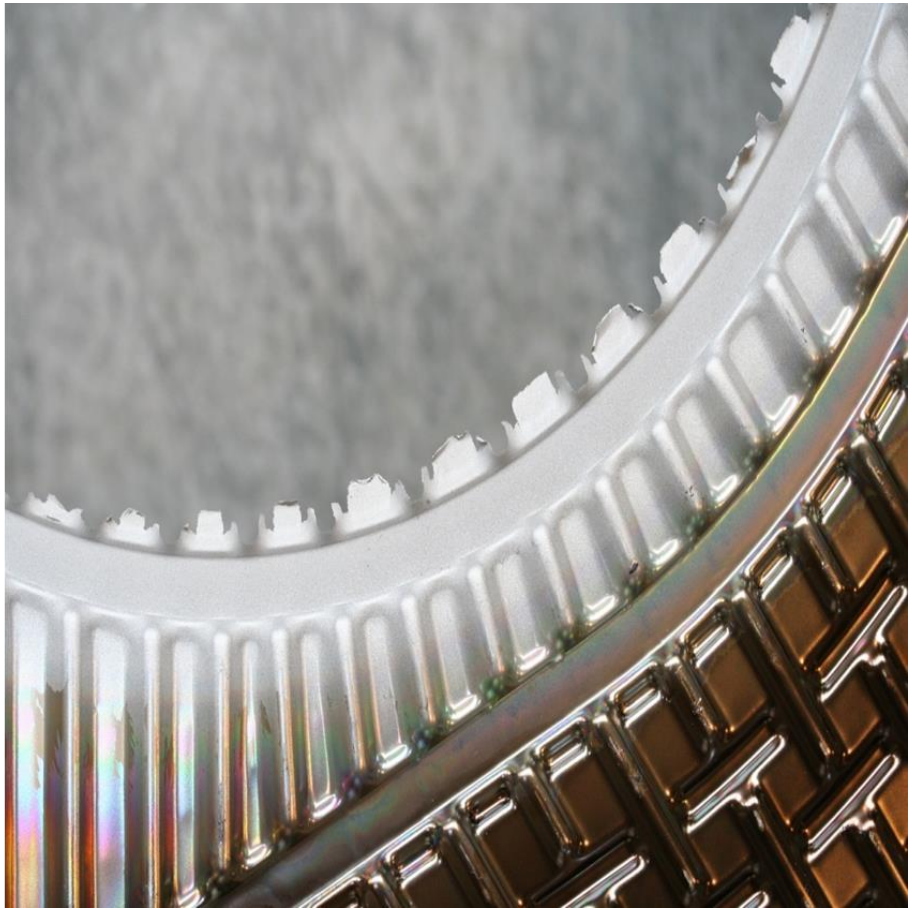
Male Pipe Thread (threaded nipple)

Raised Face Weld Neck Flange (RFWN)



- Recommended Maximum 18 fps – 24 fps (single phase media)

- Why?
  - High pressure drop through the connection
  - Port & plate erosion
  - Premature wear
  - Premature plate replacement
  - Excessive sound level



Heat Transfer Plate Material

- Stainless Steel (304 or 316) or titanium
- Typically, fluid properties and operating temperature dictate the material
- 304SS is acceptable for HVAC water/glycol

Heat Transfer Plate Thickness

- Typically, operating/design pressure dictate the thickness
- 0.4 mm - 0.8 mm
- 0.4 mm for 150 psi design pressure

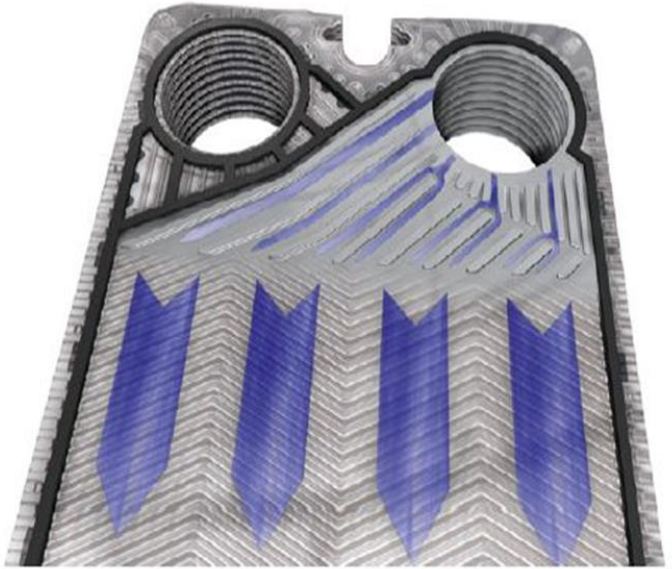
Gasket Material

- Typically, fluid properties and operating temperature dictate the material
- NBR (max >180ºF), EPDM (max >300ºF)
- NBR is acceptable for HVAC water/glycol

Conventional Plates

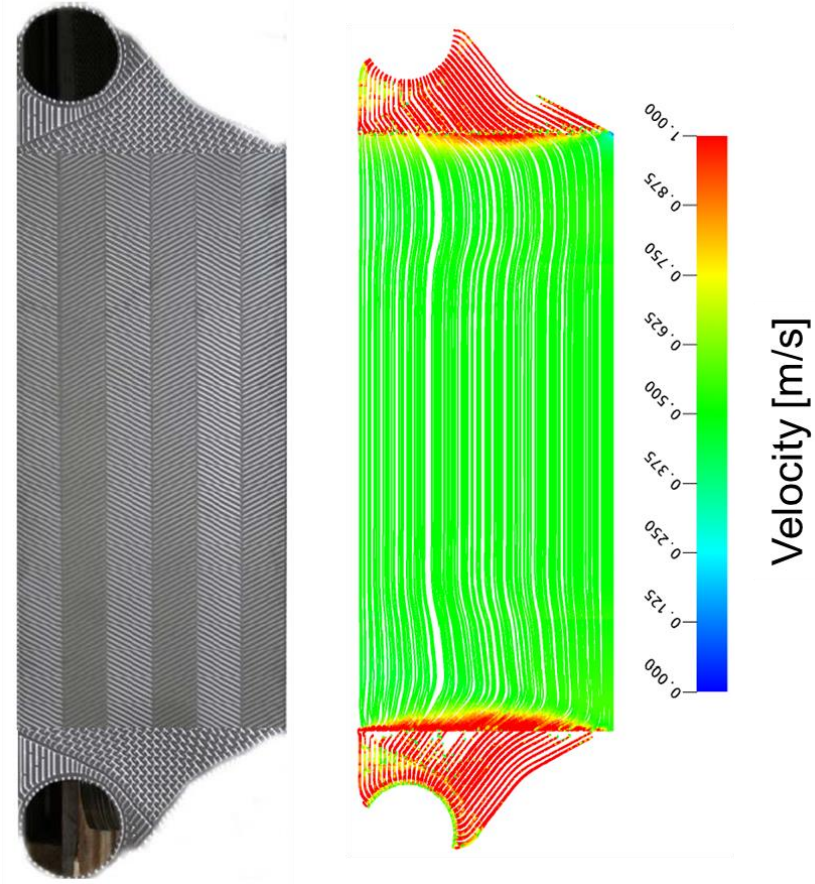
Low velocity at far corner **reduces plate performance**

Plates with Optiwave®

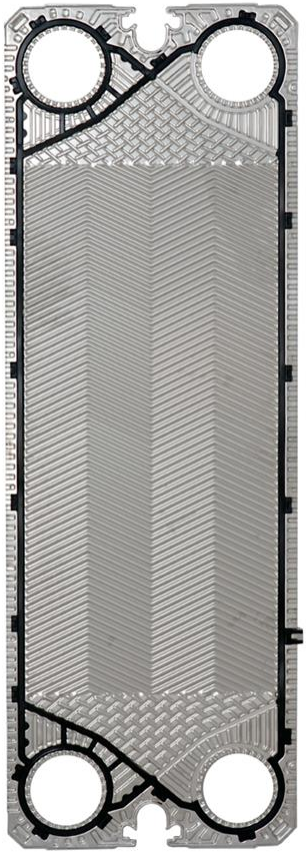


Even velocity across the plate width

- Utilizing Computational Fluid Dynamics
- Demonstrates even velocity across the entire plate



Vertical



Horizontal

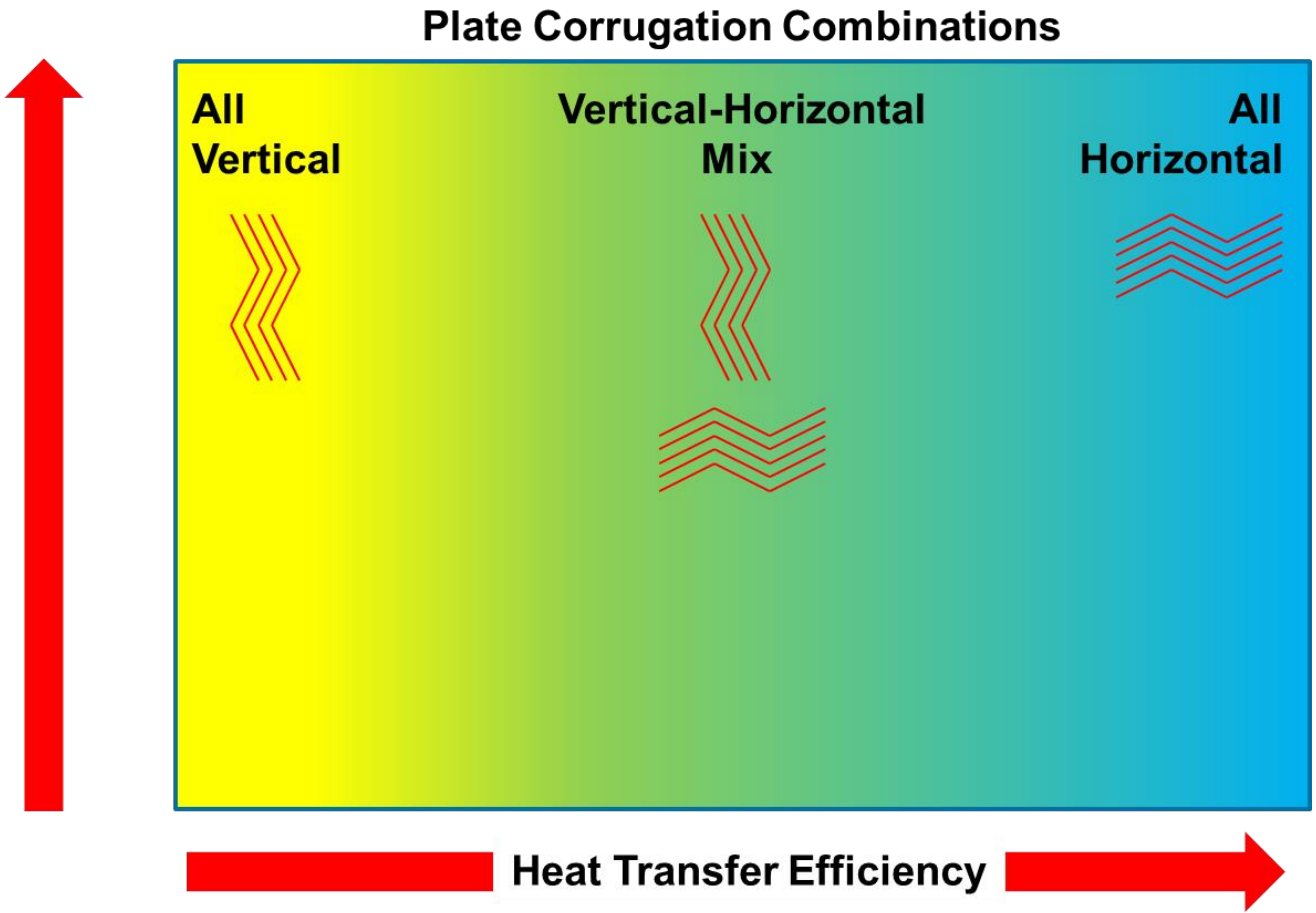
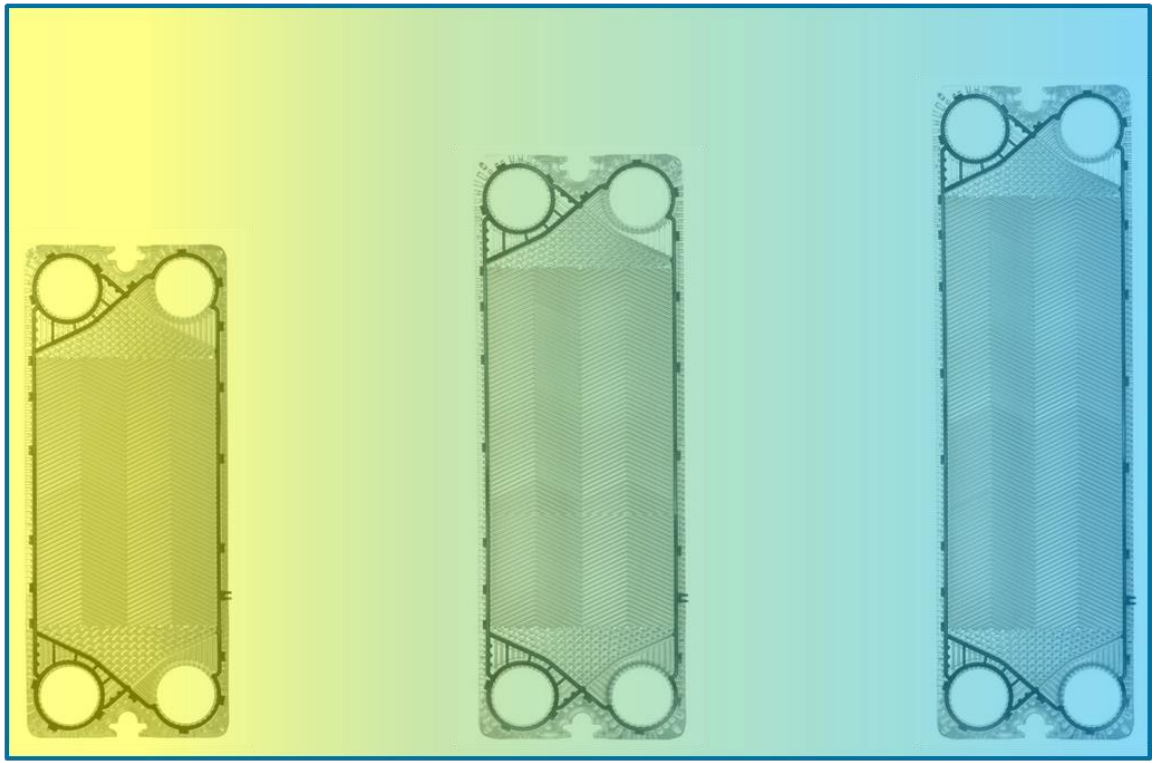


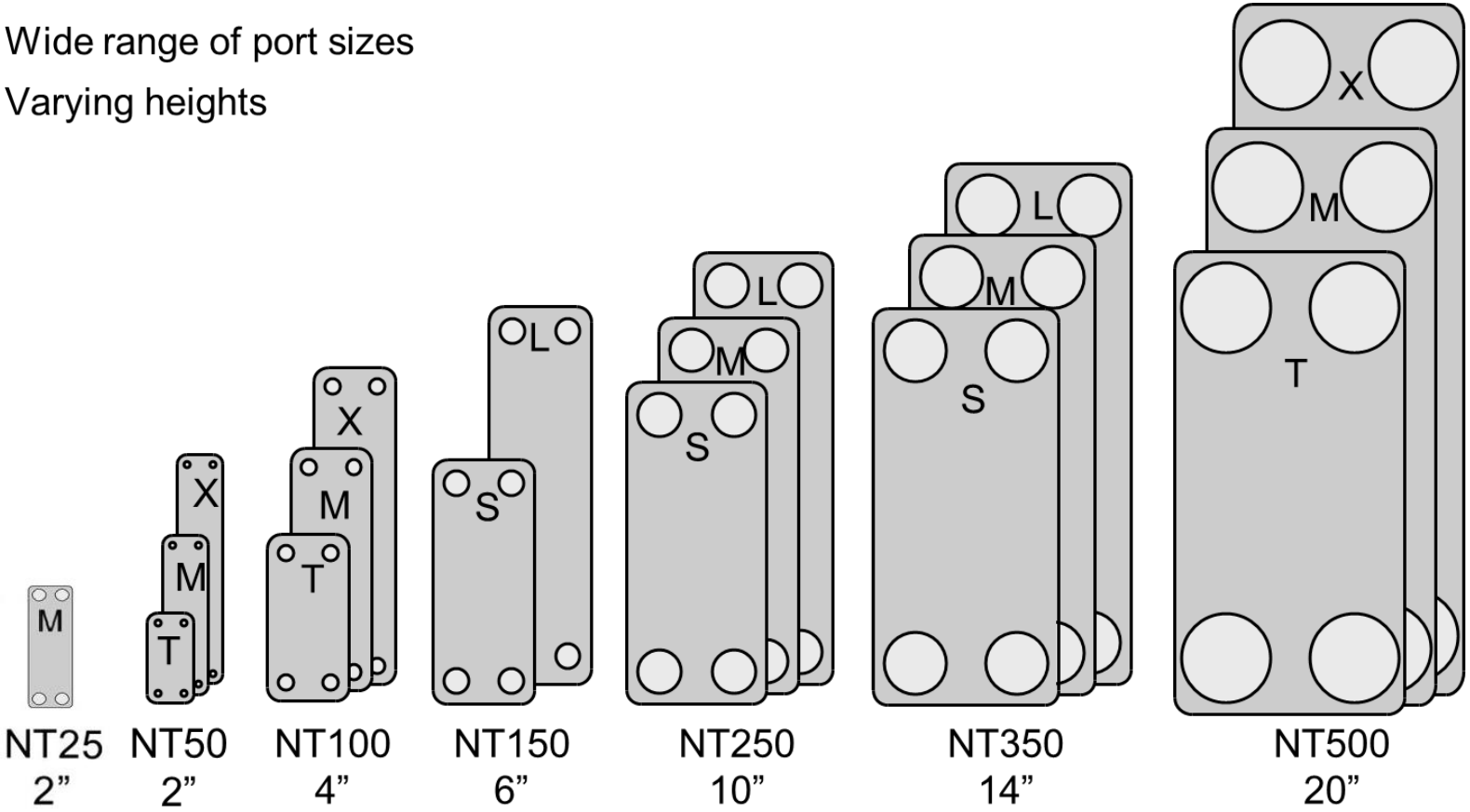
Plate Corrugation Combinations
All Vertical
Vertical-Horizontal Mix
All Horizontal
Heat Transfer Efficiency

Range of Low – to – High Aspect Ratio



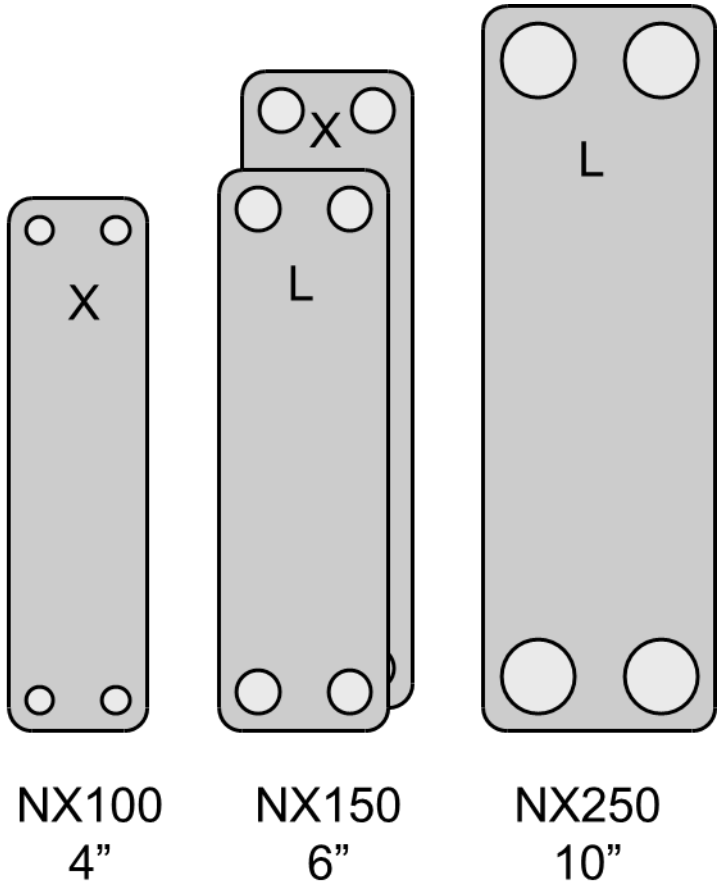
Heat Transfer Efficiency

- Wide range of port sizes
- Varying heights



Narrower Pressing Depth = More Efficient Plates

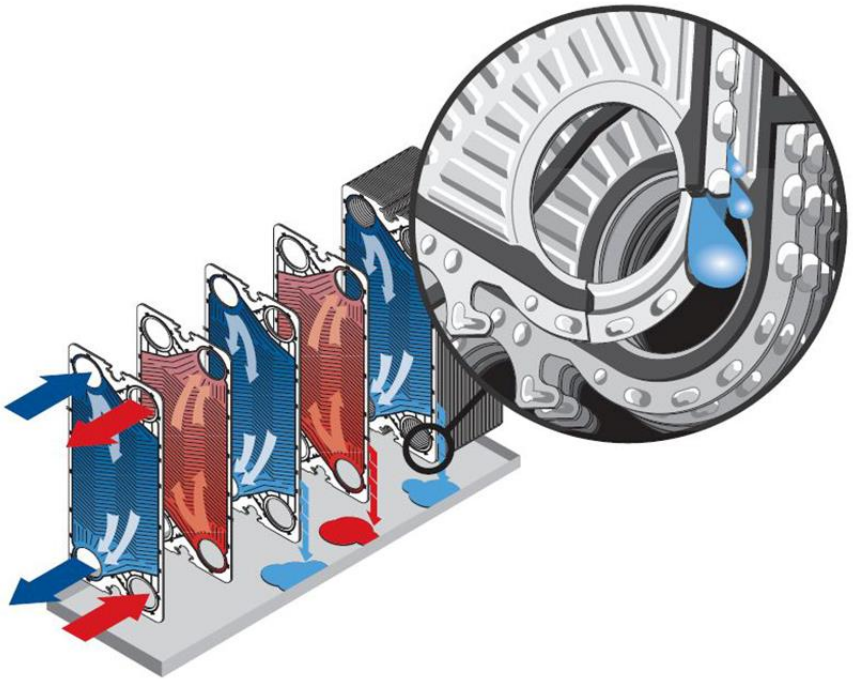
- 1° temperature approach possible
- Single pass design more likely
- Higher design pressures



Prevents intermixing of fluids

- Two plates welded together around port

- Benefits
  - High level of production safety
  - Effective heat transfer
  - Compact design
  - Low leakage risk
  - Easy maintenance



Gasketed Plate Heat Exchangers Design Considerations

$$Q = k \cdot A \cdot T_{lmtd}$$

$$T_{lmtd} = \frac{(T_{hi} - T_{co}) - (T_{ho} - T_{ci})}{\ln\left(\frac{T_{hi} - T_{co}}{T_{ho} - T_{ci}}\right)}$$

Q = Heat Transfer (btu/hour)

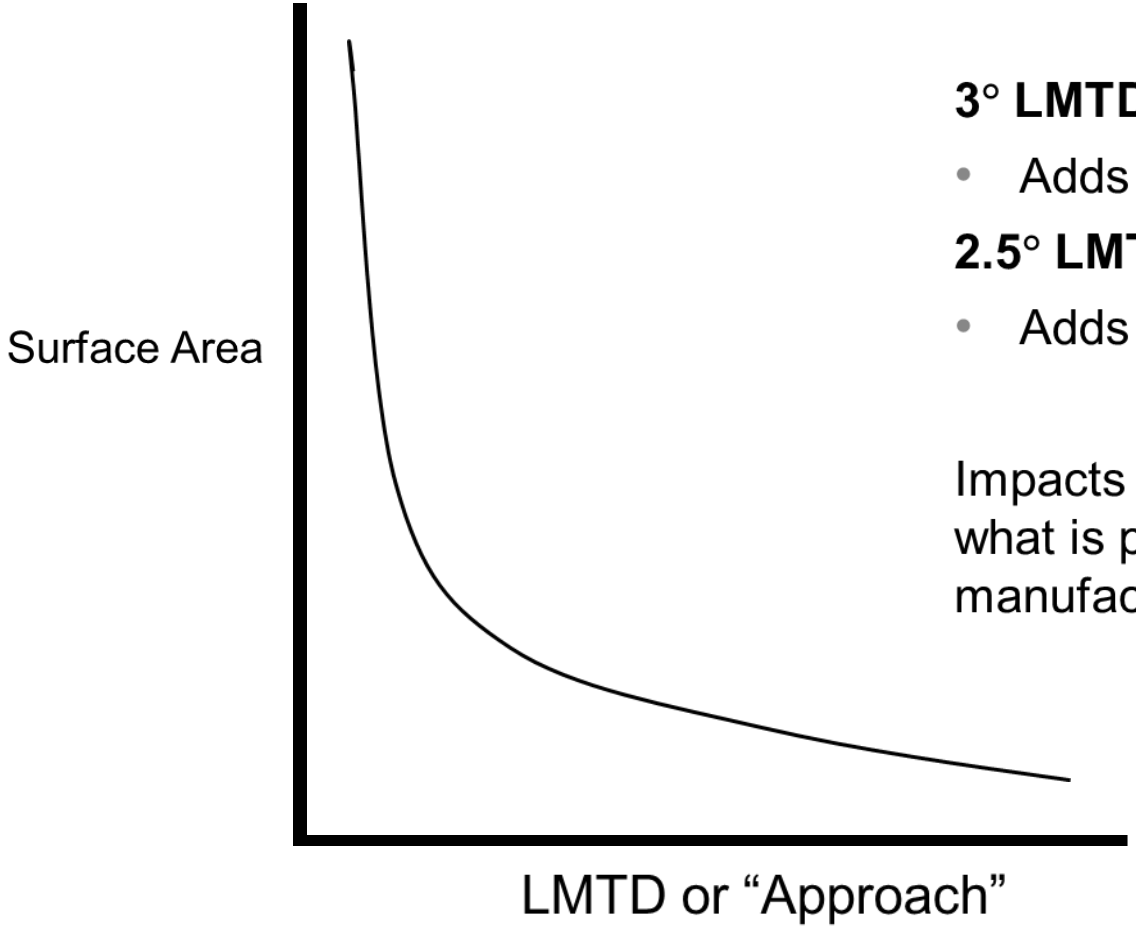
k = Overall Heat Transfer Coefficient

A = Heat Transfer Area (square feet)

T_{lmtd} = Approach Temperature (°F)

Red Items controlled by PHE Manufacturer

Black Items controlled by Design Engineer



3° LMTD to 2.5° LMTD

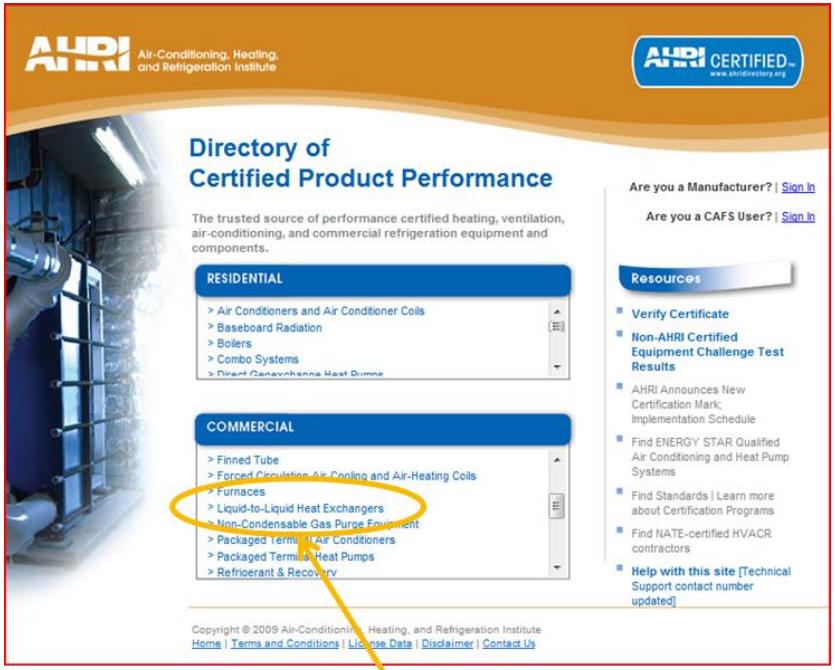
- Adds ~10% surface area

2.5° LMTD to 2.0° LMTD

- Adds ~40% surface area

Impacts project justification and what is proposed by PHE manufacturers.

- Certifies that performance is equivalent between manufacturers
- Independently tested, not self-certified
- Test results to show:
  - Load to be no more than - 5%
  - Pressure drop to be no more than +10%



"Liquid-to-Liquid Heat Exchangers"

If you are a certified participant then you must sell **only** certified product within the scope of the program.

The Current Scope – All of these have to be met!

- Maximum flow of 2,000 gpm
- Maximum duty of 24 Mbtu/h
- Water/Seawater Only (This means Glycols Are Out)
- HVAC is defined as equipment located in a residential or commercial building exclusively used for conditioning spaces for the occupants of the building.

- Find certified heat exchangers online

Kelvion
Alfa Laval
APV
Armstrong
B&G
Tranter
Sondex
Others…

AHRI CERTIFIED™
www.ahridirectory.org

www.ahridirectory.org

- Manufacturers have embraced the program

Consulting Engineers

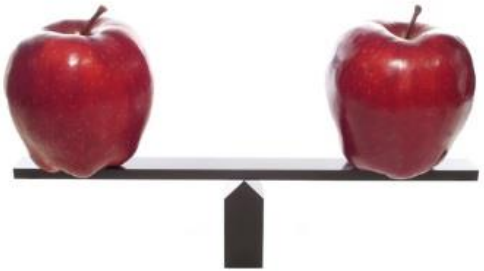
- Ensures level playing field – “apples to apples” performance
- Get what you specify – ensure promised payback

Contractors

- Straightforward bid analysis & submittals
- Risk of performance issues minimized

End Users

- System performs as designed – cost savings realized



In Conclusion

PHE’s are energy transfer devices surrounded by other certified performance equipment. AHRI certification should be required to ensure expected system performance.

More Pressure Drop Allowed…

- Fewer plates & smaller port size (less initial cost, smaller footprint)
- Higher plate channel velocities (reduced risk of fouling)
- Larger pump (more initial cost)

Less Pressure Drop Allowed…

- More plates & larger port size (more initial cost, larger footprint)
- Lower plate channel velocities (higher risk of fouling)
- Smaller pump (less initial cost)

What if there is a VFD…

- Variable Flow! What happens at lower flow?

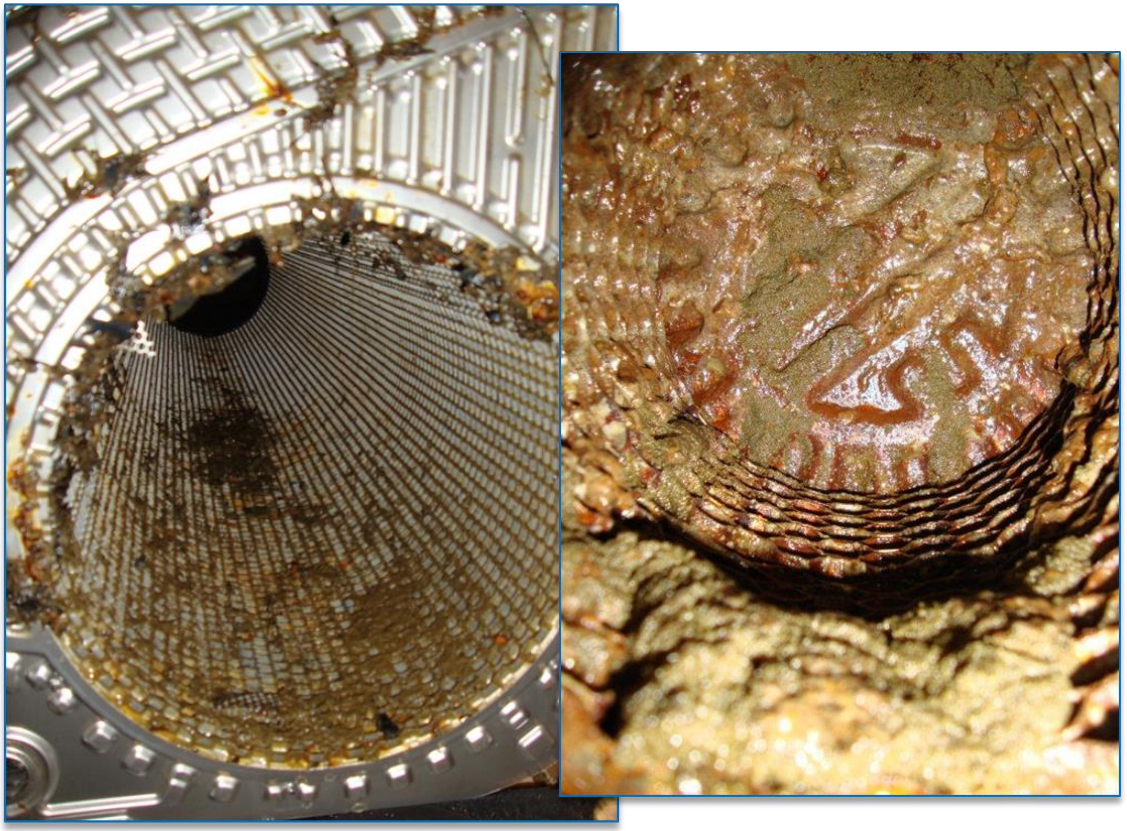
Smart design...

- Size for maximum flow, but look at effects of minimum flow.
  - Keep Channel Velocities High!
- What really is the maximum pressure drop the system can tolerate?

Fouling Happens!

Reduction measures at design stage

- Appropriate filtration
- Higher gap velocities
- Specify PM plan
- Water Treatment



Commonly Utilized in the Design of Shell & Tubes

Not Commonly Utilized in HVAC PHE Desigins

- Must be carefully applied
- Can lead to lower plate channel velocities (higher risk of fouling!)
- Application specific
- Fouling factor should reflect predicted fouling tendencies of process fluids

Can be Correlated to Other Parameters

- Surface margin %
- Closer “clean” LMTD

PHE Design Conditions

- LMTD “Approach”
- Pressure Drop – Maximum Allowed vs. Typical Operating

Getting the Design You Want

- Schedule Surface Area
- Number of Plates ≠ Performance
- Specify and Hold AHRI Certification

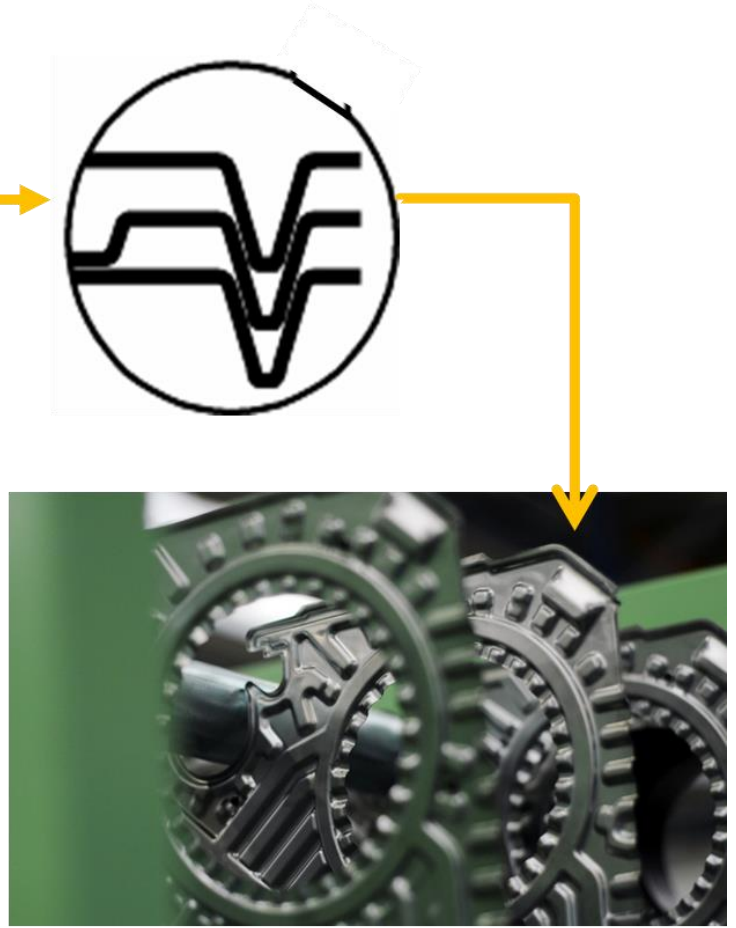
Consider Multiple PHE’s in Parallel

- Frequent Low or Variable Flow

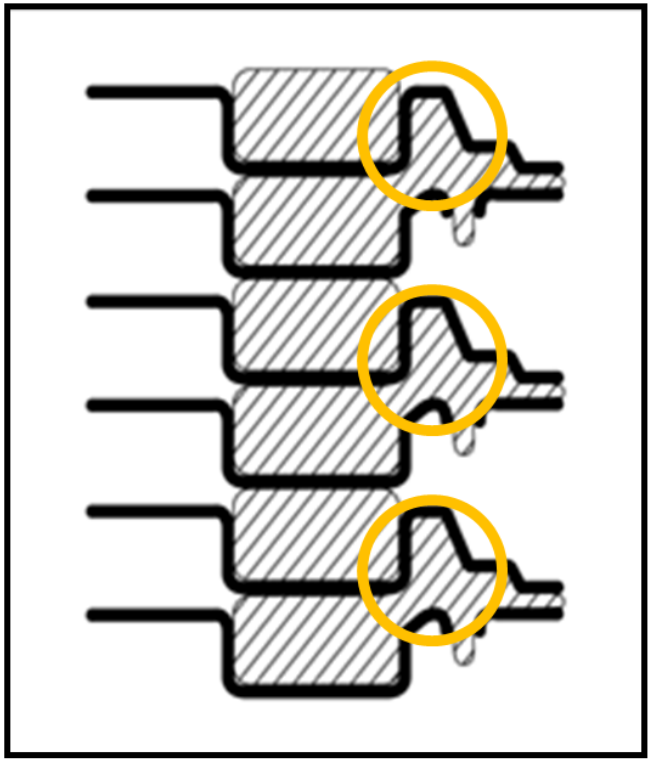
GPHE Features & Kelvion Standards

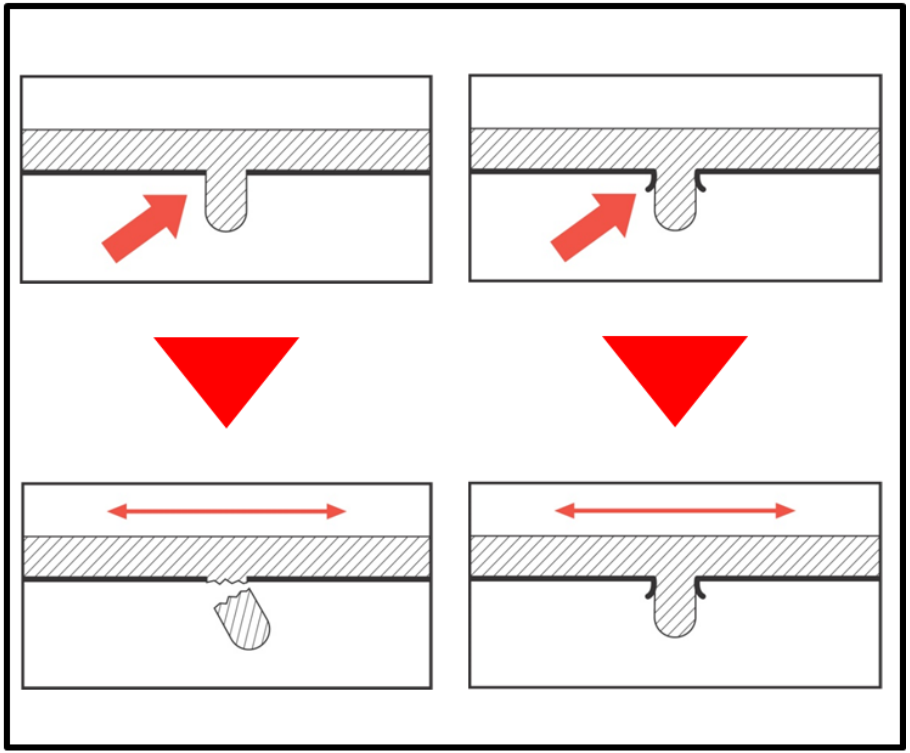
- **Gasket Attachment**
  - Industry Standard for HVAC is Tools-Free & Glue-Free

▪ Faster Maintenance
▪ Shorter Down Time
▪ Longer Gasket Life



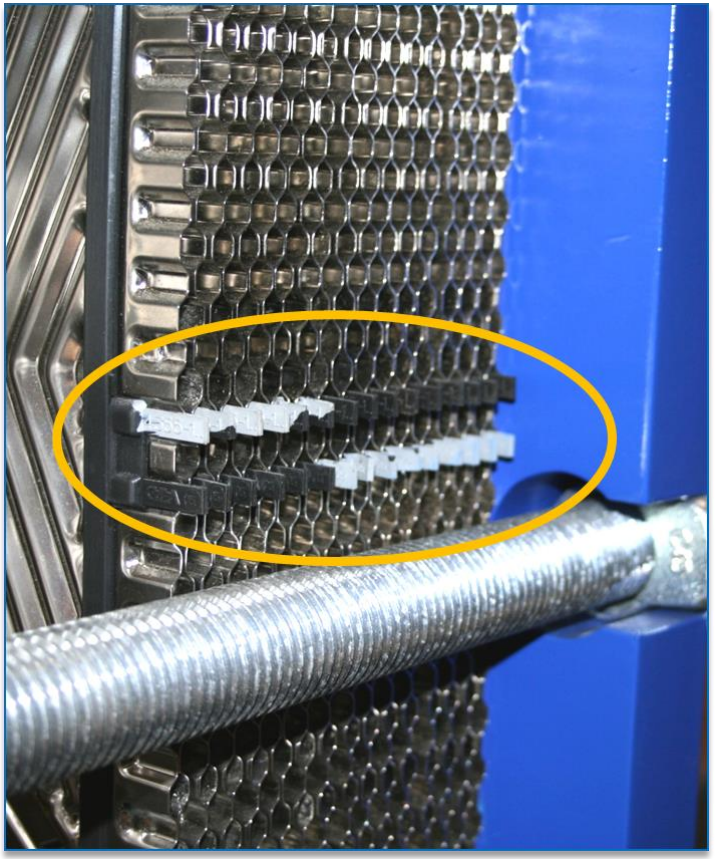
- Plate Alignment Guides





- Glueless Attachment

- Allows ID of gaskets from outside
- Color coding for material
- Re-assembly aid



*Stainless steel is **NOT** recommended due to lower tensile strength and higher risk of thread galling.*

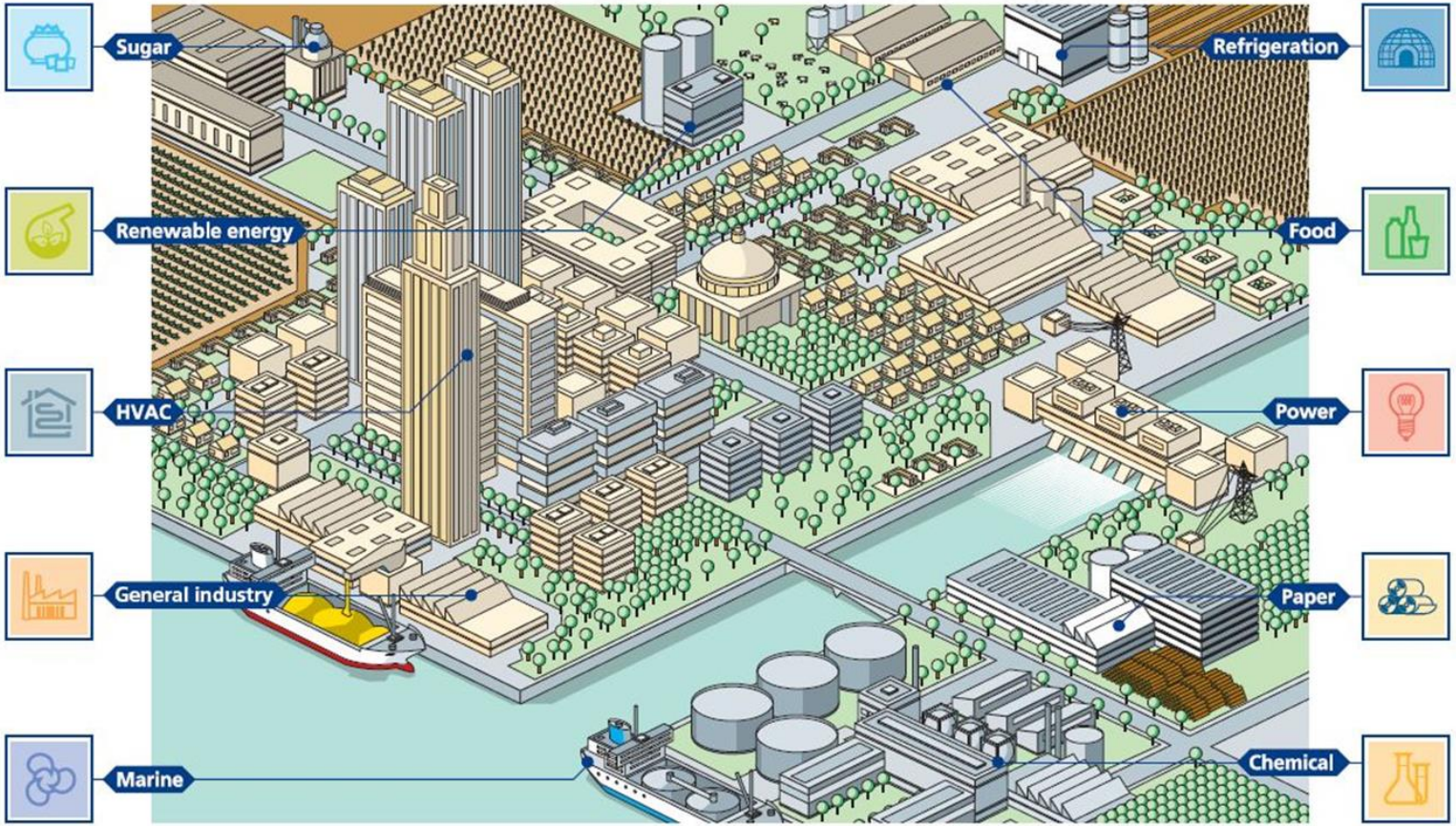
All zinc plated.

- Bushings
- Nuts
- Threaded Rod
- Washers

White Lithium grease used to lube threads.

*Stainless steel is **NOT** recommended due to lower tensile strength and higher risk of thread galling.*

Gasketed Plate Heat Exchangers Applications


Sugar
Renewable energy
HVAC
General industry
Marine
Refrigeration
Food
Power
Paper
Chemical

Utilizing a Cooling Tower/PHE Combo to Reduce Chiller Energy Costs

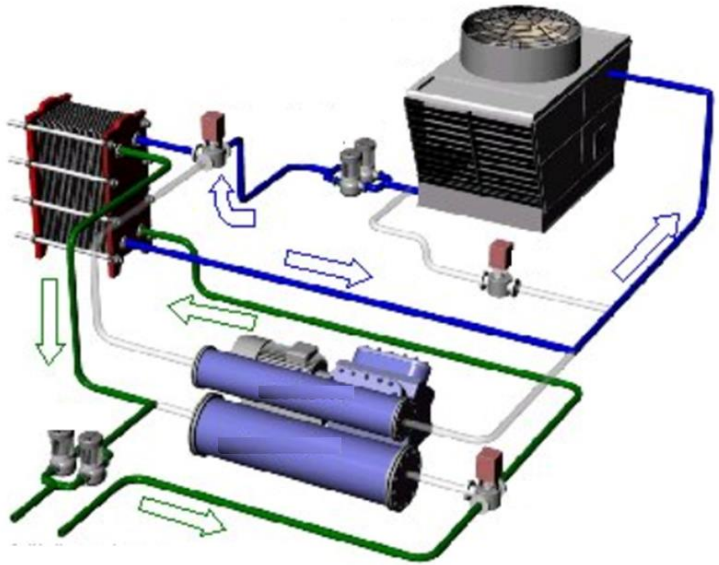
“Free Cooling”

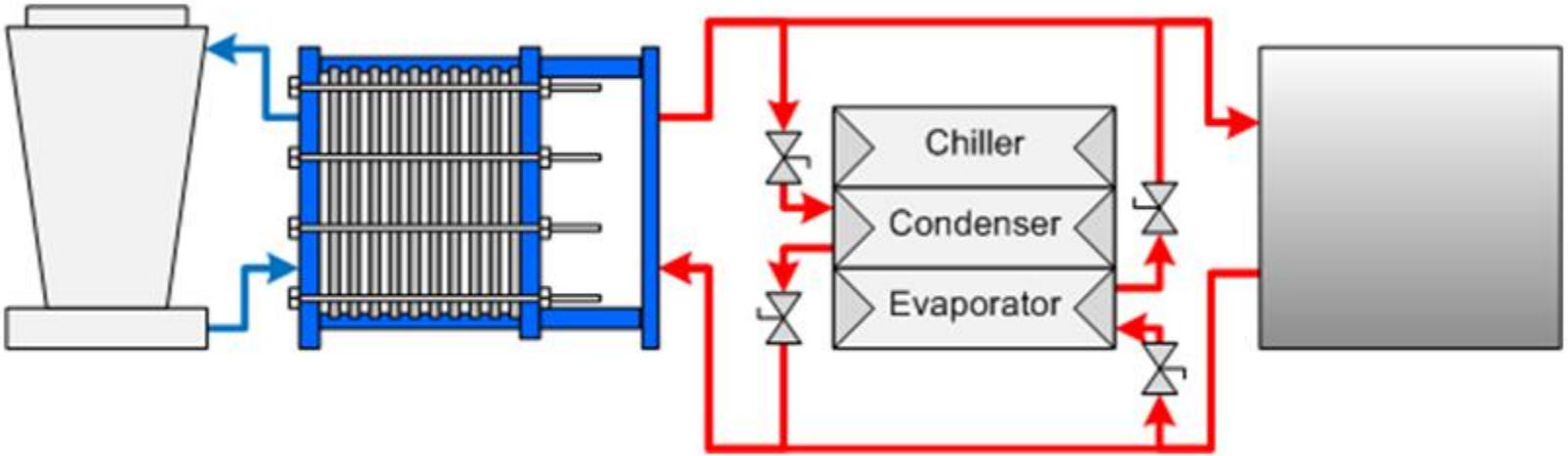
- Parallel Configuration: Chiller is turned off and bypassed

or

“Pre-Cooling, Free-Cooling”

- Series Configuration: Chiller operates on reduced load or is turned off

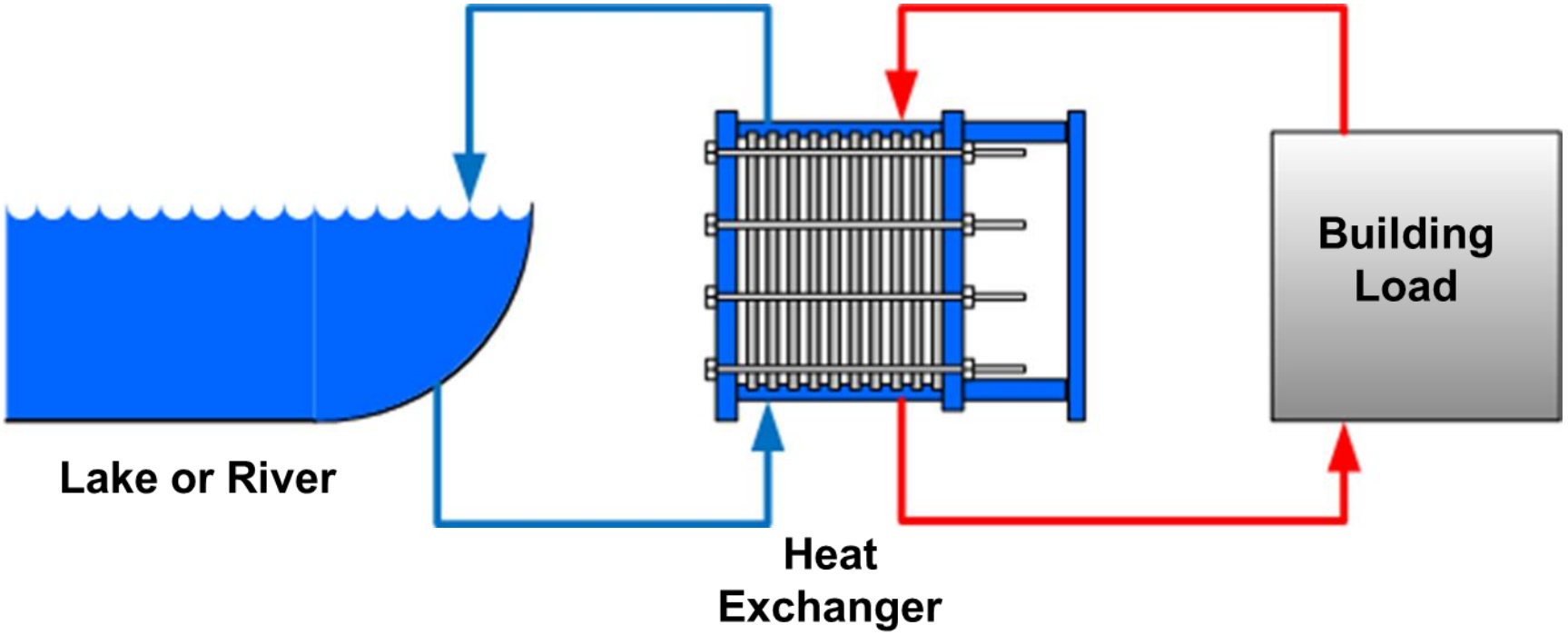


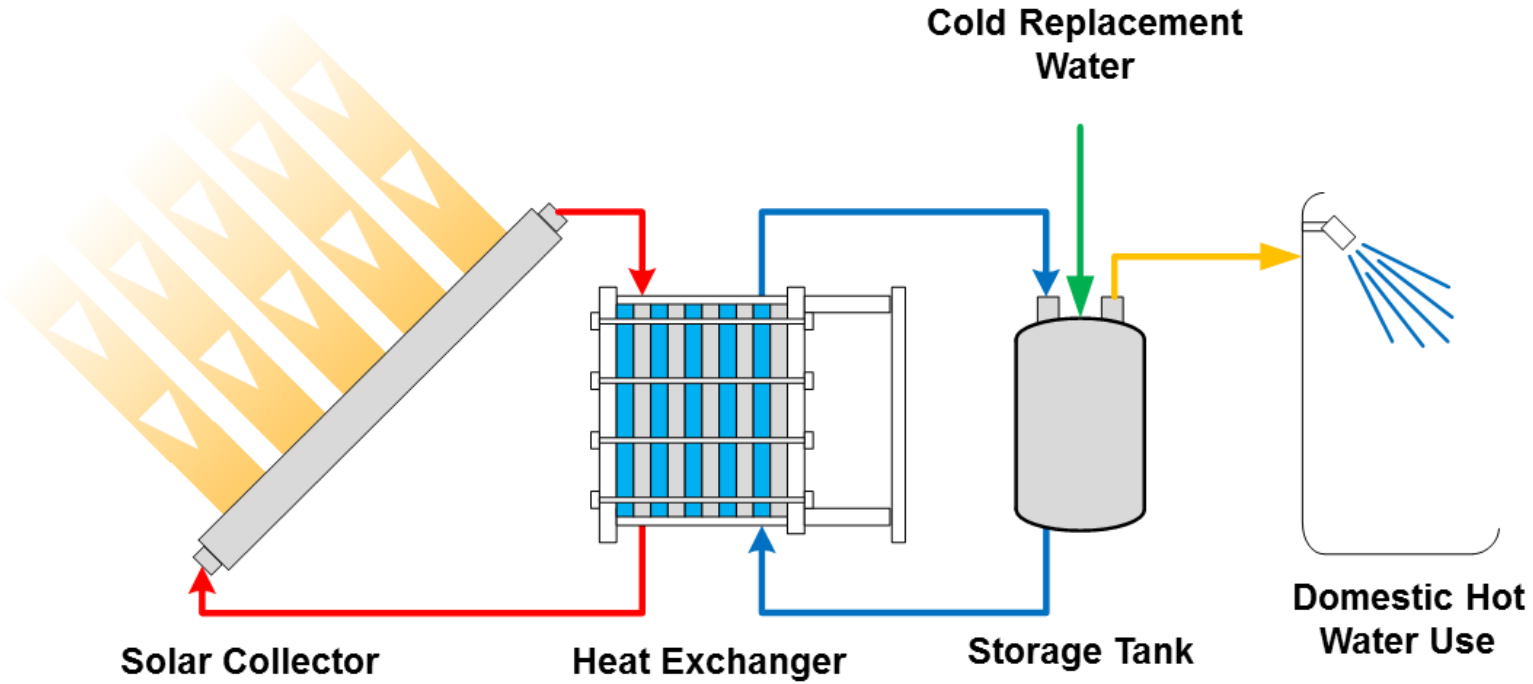


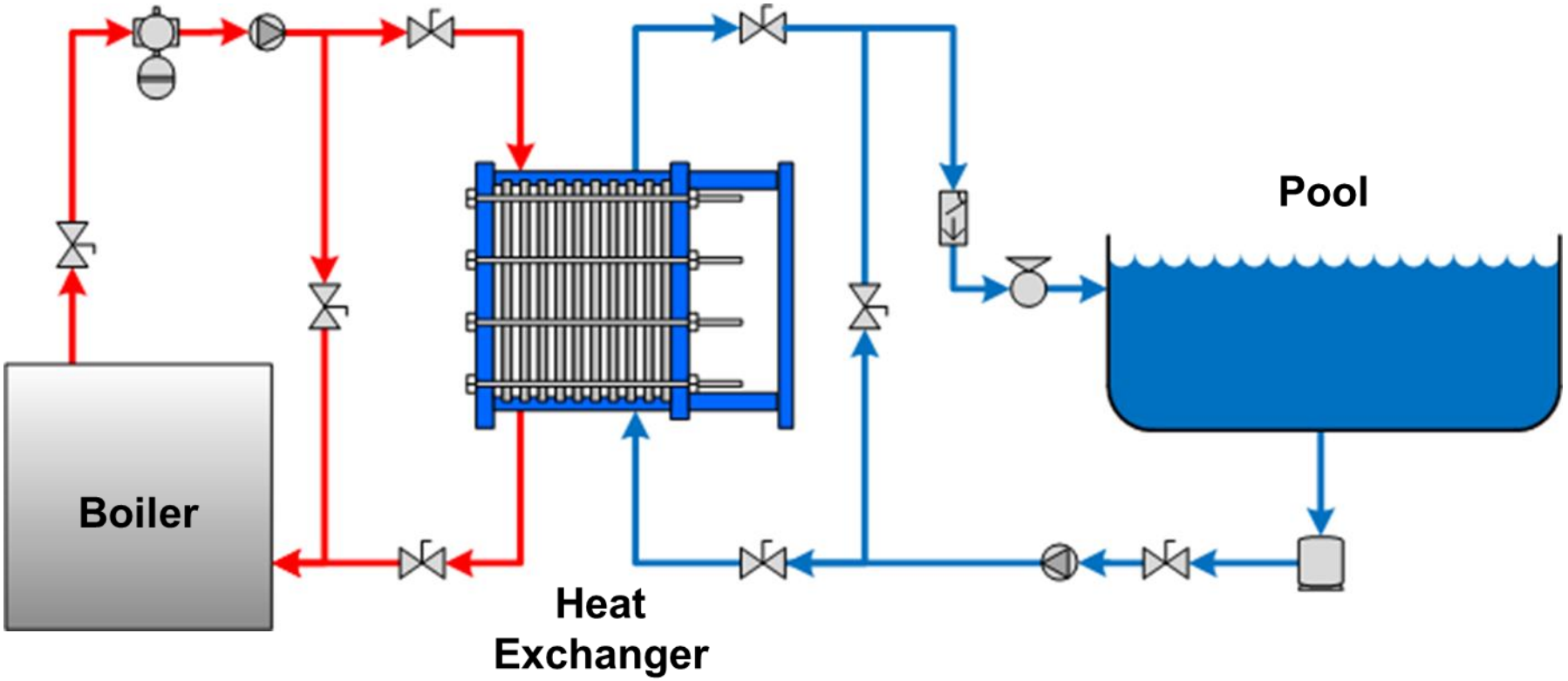
Cooling Tower

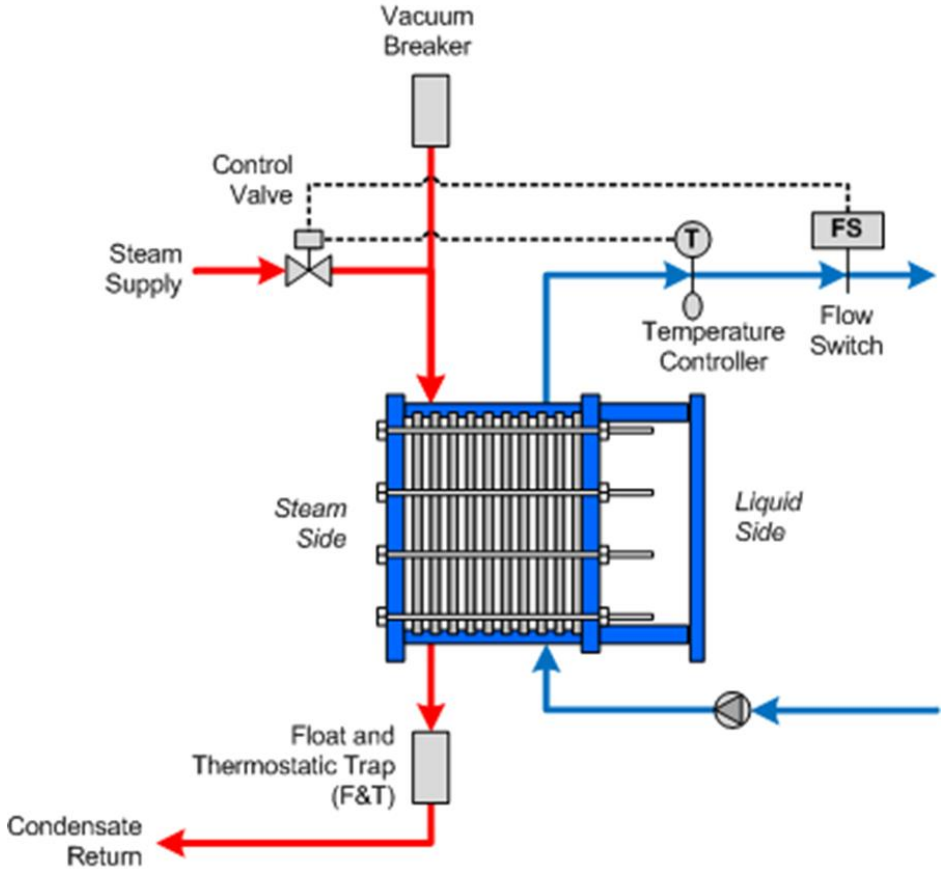
Heat Exchanger

Cooling Load


Building
Load
Lake or River
Heat
Exchanger

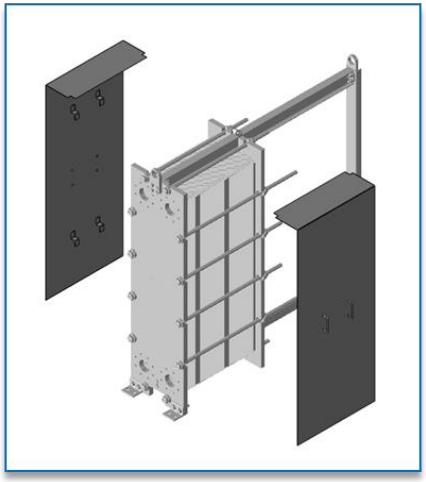

Cold Replacement Water
Solar Collector
Heat Exchanger
Storage Tank
Domestic Hot Water Use

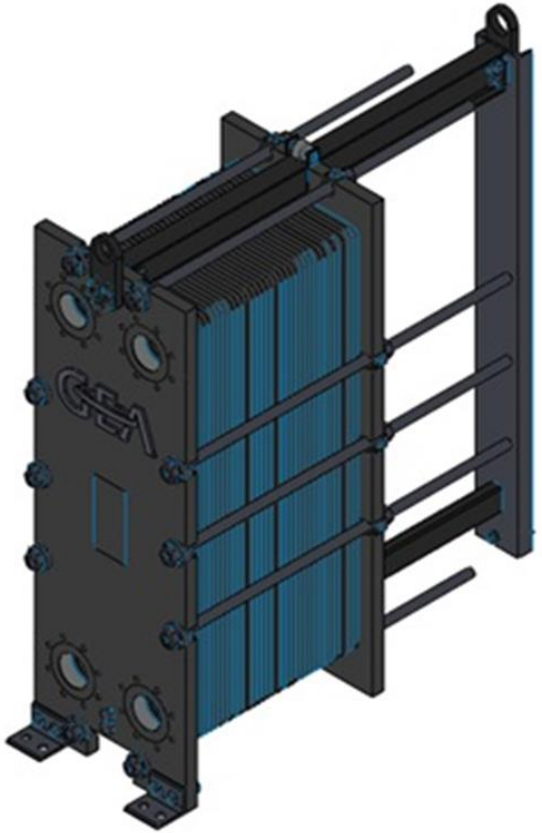

Pool
Boiler
Heat
Exchanger


Vacuum
Breaker
Control
Valve
Steam
Supply
T
FS
Temperature
Controller
Flow
Switch
Steam
Side
Liquid
Side
Float and
Thermostatic Trap
(F&T)
Condensate
Return

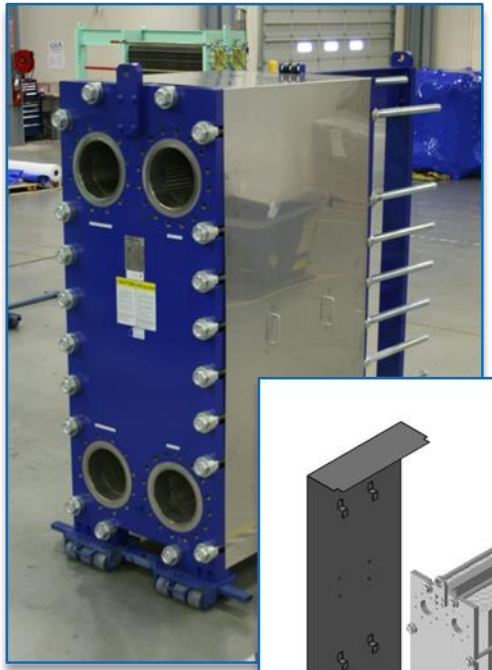
Gasketed Plate Heat Exchangers
Accessories and Options

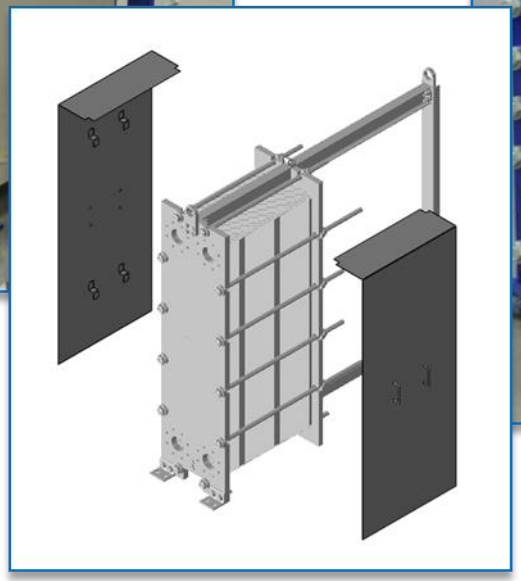
- .SAT file extension
- Accurately scaled model
- Active connections



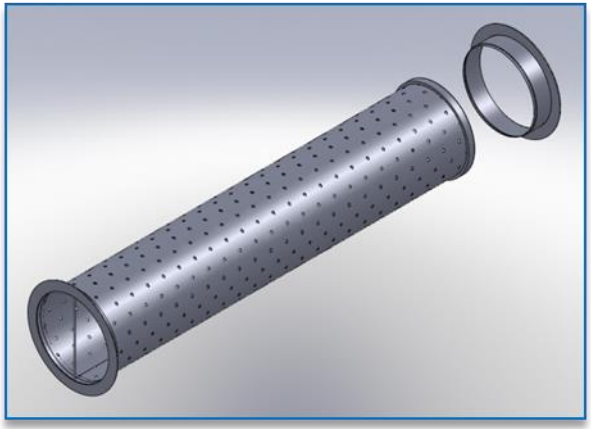


- Protects operator from harm caused by leaks
- 2-Piece construction for easy removal and installation
- Hooks over tie rods
- Stainless Steel

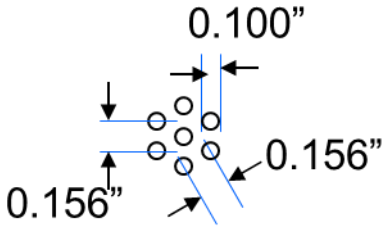




- Good for preventing the use of a heat exchanger as a filter.
- Excellent “Insurance Policy”
- Recommended for connection sizes 6” and up.
- Use Y-strainer for connection sizes 4” and smaller.



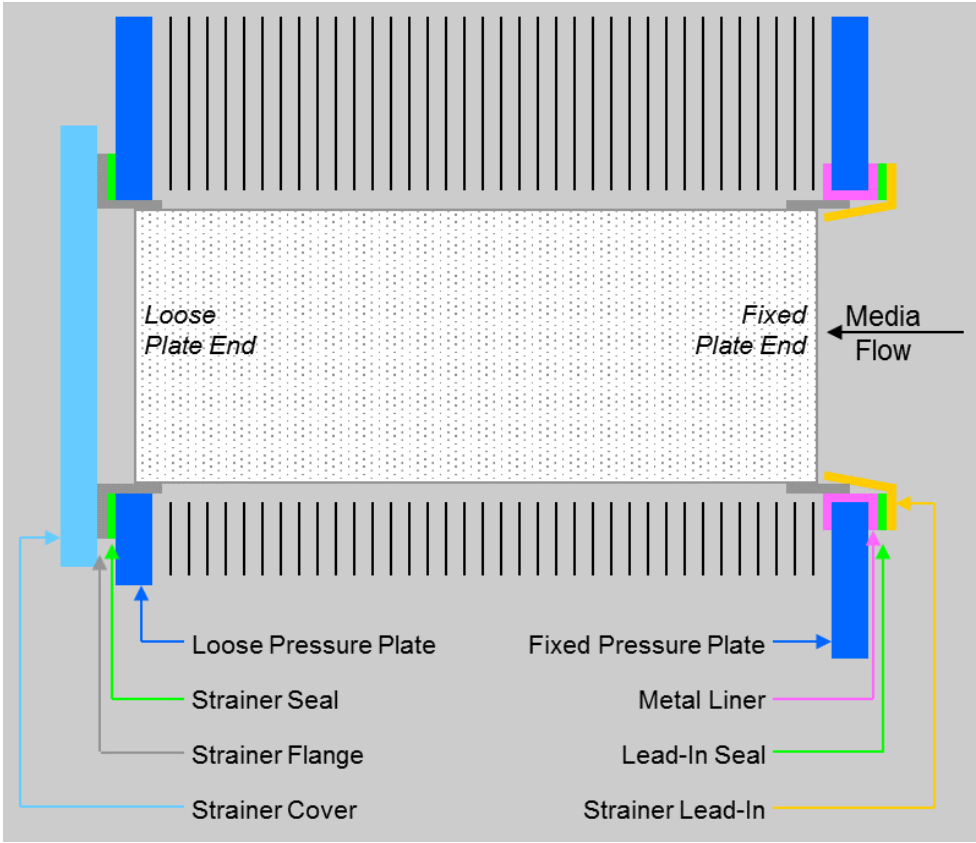
- Material matches the heat transfer plate.
- Strainer Seal is Klingersil
- Strainer Cover is carbon steel lined with material to match the heat transfer plate.



Typical hole pattern

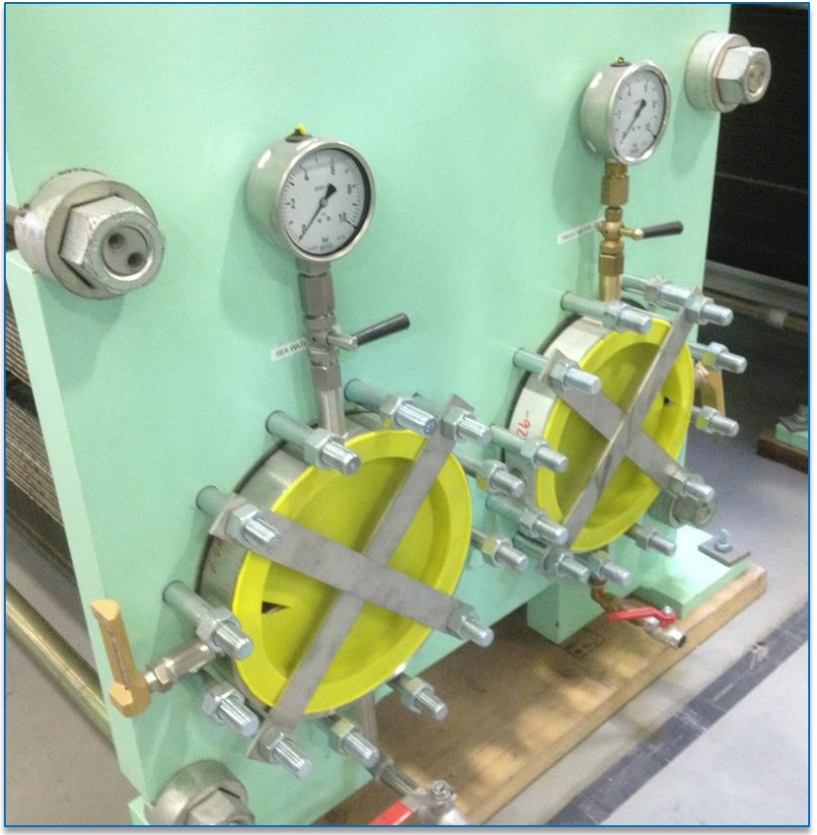
0.100” diameter hole

0.156” staggered centers



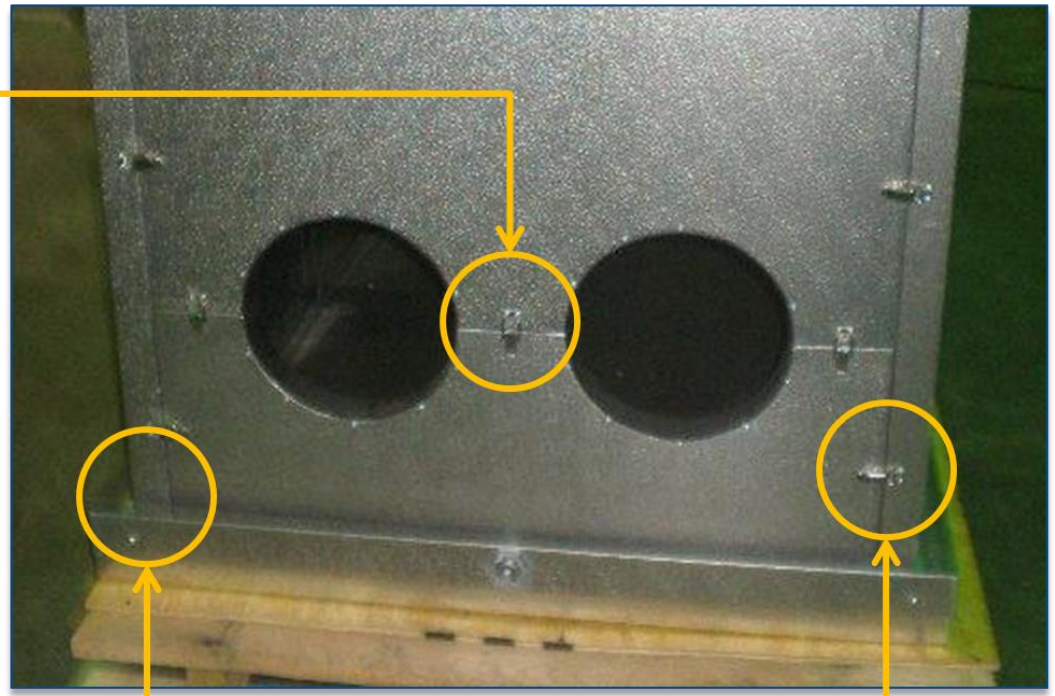
GEA
GEA PHE Systems

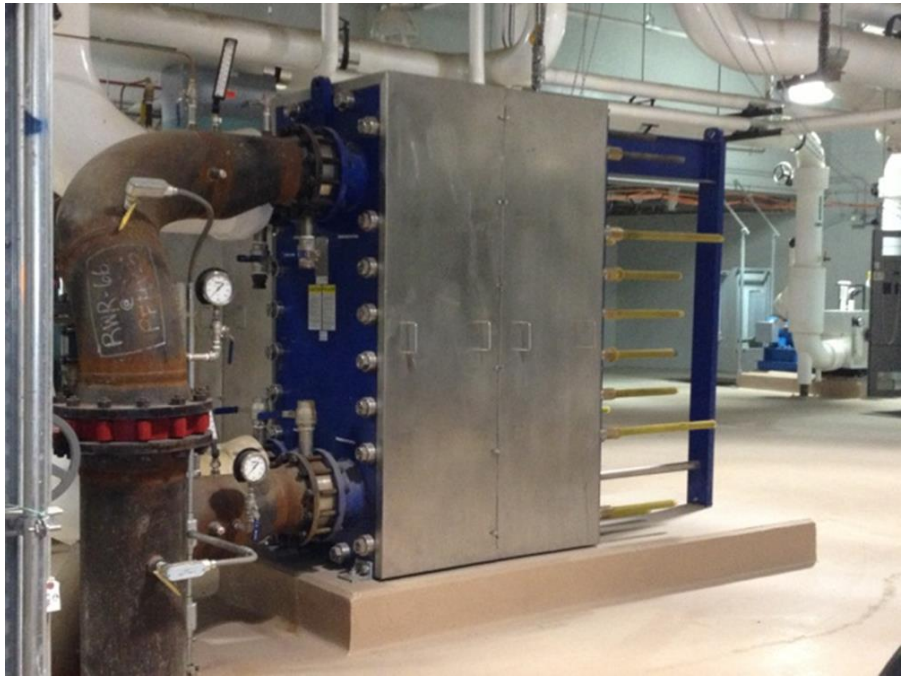
- Pressure
- Temperature
- Space-Saving
- Easier Troubleshooting
- Can be sold to the contractor at time of PO

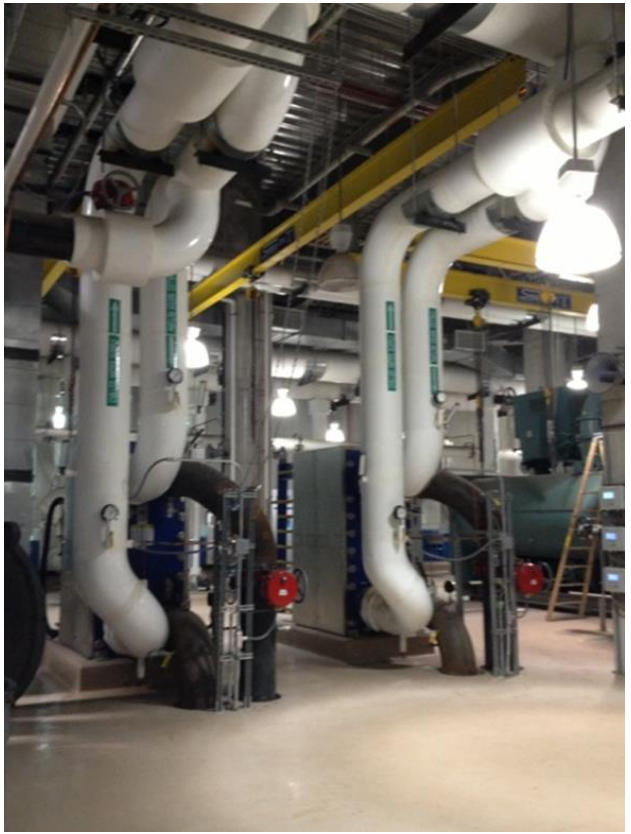


- Clean and flush without decommissioning, without opening
- Less downtime
- Pneumatic or electric actuator
- Control Panel included

- R-value 12.5
- Insulation Material rigid foam bonded to aluminum face material on both sides
- Drip Tray included, made of galvanized steel
- Penetration and Seal for Bolts through drip tray
- Multiple pieces for easy installation and removal


Multiple pieces allow removal without unpiping
Completely inside drip tray
Cabinet latches hold panels together





WTC Chiller Plant (Titanium Plates)

Supply full service center activities as follows: <u>Sioux City Iowa</u>

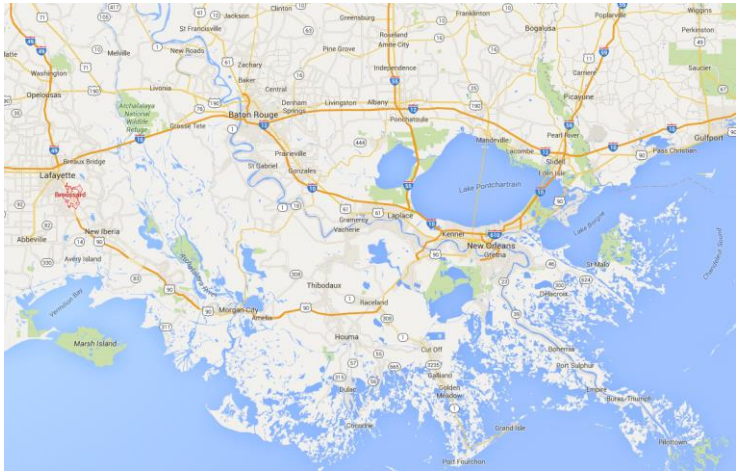
- Disassemble units
- Remove gaskets from plates
- Chemically clean all plate types up to 13’ long and 55” wide(Sodium hydroxide and phosphoric acid)
- Mechanically clean all plate types (High pressure power washing)
- Dye penetrant leak detection
- Gasket plates
  - Lock in
  - Glue in place (standard is Pliobond 30)
  - 2 part epoxy
- Reassemble units
- Hydrostatically pressure test units

Supply full service center activities as follows: <u>Broussard, LA</u>

- Disassemble units
- Remove gaskets from plates
- Chemically clean all plate types up to 9’6” long and 49” ta(Sodium hydroxide and phosphoric acid)
- Mechanically clean all plate types (High pressure power washing)
- Dye penetrant leak detection
- Gasket plates
  - Lock in
  - Glue in place (standard is Pliobond 30)
  - 2 part epoxy
- Reassemble units
- Hydrostatically pressure test units

•Future Service center capabilities in LA

- Block cleaning line. This line is currently in design and has been approved for construction in Q1 of 2016.
- Shell & Tube cleaning line. This line is currently in design and will be tentatively implemented in Q2 of 2016.

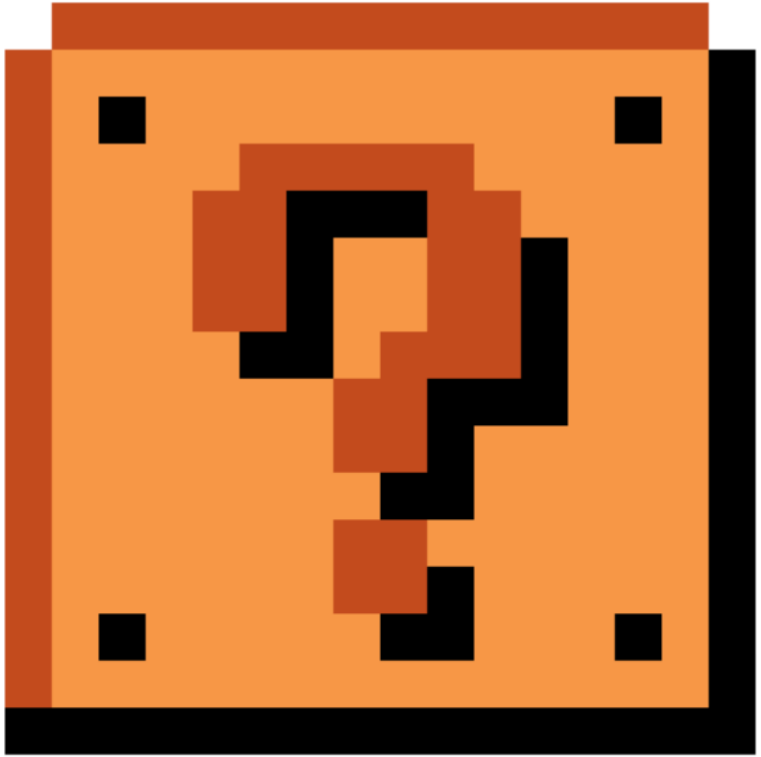


Field Service capabilities: <u>All of North America</u>

- Currently we have one field service technician. We will be adding another person to that team in the near future to create a 2 person service team. They are currently located out of the Sioux City, SD facility and will be servicing units throughout the Midwest.

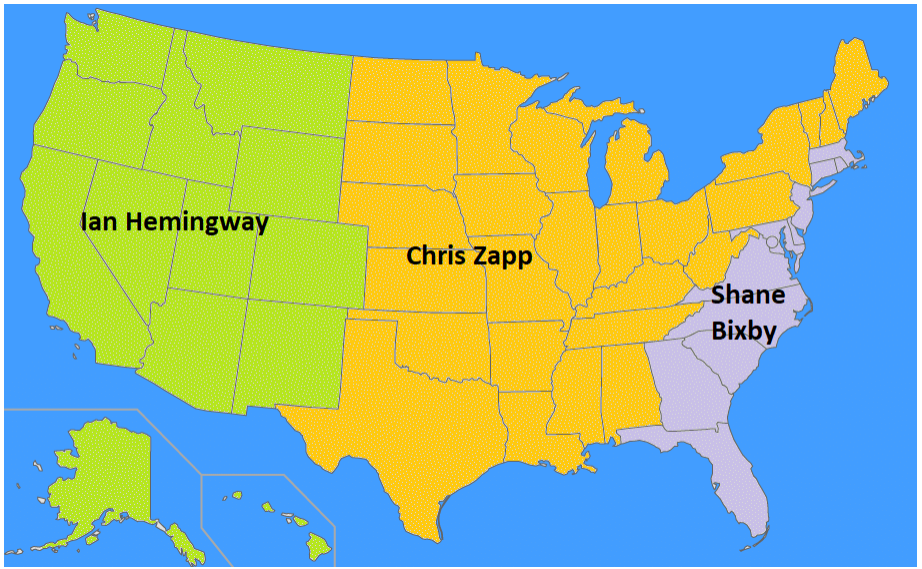
- A plan is being formulated to also put a service team in place for the gulf coast region stationed out of the Broussard, LA facility.

- As these needs grow we will be happy to add Field Service Techs to provide the services customers need.



CONTACT SLIDE

Ian Hemingway
Kelvion Inc.
3100 Farmtrail Road, 2nd Floor
York, PA 17406
717-825-5614
Ian.Hemingway@Kelvion.com



www.kelvion.com