NPE Series: Condensing tankless water heaters

**NPE-Advanced**

Advanced high-efficiency tankless water heater technology for residential and commercial applications with exclusive ComfortFlow® recirculation.

**NPE-Standard**

Ultra condensing tankless technology for residential and commercial applications is the industry’s top rated unit for energy efficiency.

**ComfortFlow® recirculation system**

Navien ComfortFlow® is the first and only system that incorporates a buffer tank and recirculation pump. The buffer tank eliminates the “cold water sandwich” effect commonly found in other tankless water heaters. The recirculation pump saves on your water bills by reducing time to get hot water. When activated, the optional ComfortFlow mode results in additional energy usage.

**NaviLink® optional Wi-Fi remote control system**

This add-on accessory will enable customers with smartphones and tablets to control temperatures remotely, access usage data and receive diagnostic notifications on all Navien products (NPE, NPN, NCB-E, NFC, NHB, NFB, NFB-C). Existing installations/stock may require the purchase of a new main PCB and front control panel.

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**THE LEADER IN CONDENSING TECHNOLOGY**
Navien Ready-Link® manifold systems

Now manifold mounting on a wall or rack is as simple as 1-2-3-4

1 Pick your Navien Units, NPE-A or NPE-S
2 Pick your location, wall or rack
3 Pick your manifold kit
4 Pick your venting system

Manifold kit components

Each kit includes the following items in varying quantities based on the kit selected:

- 3/4" x 3/4" Adapter
- 3/4" NPT Ball Valve
- 1-1/2" Gas Union
- 2" Copper End Cap
- 2" Copper Coupling
- 2-1/8" Strut Clamp
- Hardware Kit
- 3/4" Service Valves with PRV
- 1-5/8" x 18" Strut Channel (14ga)
- 3/4" x 24" SS Corrugated Flex Connector
- 3/4" x 30" Gas Flex Connector
- 3/4" x 18" SS Corrugated Flex Connector
- 1-1/2" FPT Galvanized Iron End Cap
- 1-7/8" OD Strut Clamp

Simple same day assembly
No waiting for expensive bulky factory assembled racks. Everything is available at your local Navien wholesaler with an easy to follow installation manual.

Simple to transport
Every component of the system is portable for easy pickup and setup. All parts of the kit fit through a standard door opening.

Simple to expand
Ready-Link® wall or rack manifold kits can be built in 30 configurations from 2–16 units. Common venting up to 8 units. Cascading up to 16 units.

Simple way to make more money
You handle the installation yourself, on your terms and time frame.

Back-to-back kits

2 back-to-back 30019039A
4 back-to-back 30019042A

Side-by-side kits

2 side-by-side 30019040A
3 side-by-side 30019041A
4 side-by-side 30019043A

Ready-Link® Rack Base and Add-on Components sold separately.
### NPE-240 (A or S) 199,900 BTU/H Tankless Water Heater Application Guide

All Calculations are Based on a 100 Degree Fahrenheit Temperature Rise

<table>
<thead>
<tr>
<th>Tankless Count</th>
<th>Tankless Only Application Flow Rates</th>
<th>Tankless with Storage Gallons per Hour (GPH)/1st Hour (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GPM Flow @ 100°F Rise</td>
<td>GPH Flow @ 100°F Rise (1)</td>
</tr>
<tr>
<td>1</td>
<td>3.9</td>
<td>234</td>
</tr>
<tr>
<td>2</td>
<td>7.8</td>
<td>468</td>
</tr>
<tr>
<td>3</td>
<td>11.7</td>
<td>702</td>
</tr>
<tr>
<td>4</td>
<td>15.6</td>
<td>936</td>
</tr>
<tr>
<td>5</td>
<td>19.5</td>
<td>1,170</td>
</tr>
<tr>
<td>6</td>
<td>23.4</td>
<td>1,404</td>
</tr>
<tr>
<td>7</td>
<td>27.3</td>
<td>1,638</td>
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<tr>
<td>8</td>
<td>31.2</td>
<td>1,872</td>
</tr>
<tr>
<td>9</td>
<td>35.1</td>
<td>2,106</td>
</tr>
<tr>
<td>10</td>
<td>39.0</td>
<td>2,340</td>
</tr>
<tr>
<td>11</td>
<td>42.9</td>
<td>2,574</td>
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<tr>
<td>12</td>
<td>46.8</td>
<td>2,808</td>
</tr>
<tr>
<td>13</td>
<td>50.7</td>
<td>3,042</td>
</tr>
<tr>
<td>16</td>
<td>62.4</td>
<td>3,744</td>
</tr>
</tbody>
</table>

---

(1) Tankless unit only system has controlled outlet temperature/flow. GPH requirement should be considered to be the peak maximum GPM flow rate x 60 min.

(2) Tankless with Storage GPM 1st hour output is calculated by tankless recovery rate and 75% of available storage capacity.

NPE (A) Advanced Tankless includes Internal Circulator & Buffer Tank — NPE (S) Standard Tankless

NPE (S) Standard Tankless commonly used when Storage is applied with required external circulator(s) and situations that have high volumes of domestic hot water draws.

A minimum of two tankless units is recommended in all commercial applications.

---

### NPE (A or S) Commercial Applications Existing Replacement Guide

<table>
<thead>
<tr>
<th>Existing or Spec’d Tank Water Heater / Equipment</th>
<th>NPE (A) Advanced Tankless Includes Internal Circulator &amp; Buffer Tank — NPE (S) Standard Tankless</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) 65-80 MBTU/H</td>
<td>100 Gallon Tank</td>
</tr>
<tr>
<td>(1) 180-199 MBTU/H</td>
<td>100 Gallon Tank</td>
</tr>
<tr>
<td>(1) 250 MBTU/H</td>
<td>100 Gallon Tank</td>
</tr>
<tr>
<td>(1) 275 MBTU/H</td>
<td>100 Gallon Tank</td>
</tr>
<tr>
<td>(1) 310-399 MBTU/H</td>
<td>100 Gallon Tank</td>
</tr>
<tr>
<td>(1) 400 MBTU/H</td>
<td>100 Gallon Tank</td>
</tr>
</tbody>
</table>

(a) Tankless with storage tank does not reach Navien Energy Efficiency ratings published due to standby and piping losses, lower unit flow rates and temperature rise operation.

1. Always use Bronze or Stainless Steel trimmed domestic water circulators for both tankless to tank operations as well as domestic recirculation function.
2. Above reference guide provided should be verified with actual application and domestic hot water requirements.
Multiple NPE-A with External Recirculation Example
Using Tankless Internal Circulator(s)

Flow (GPM) 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00 6.00 7.00 8.00 9.00
Loss (FT) 2.31 4.62 6.93 9.24 12.86 20.79 24.95 30.03 38.12 50.82 65.84 85.93 109.26
°F Temperature Rise ≥ 150 ≥ 150 ≥ 150 ≥ 150 129.27 110.81 96.96 86.18 77.57 64.64 55.40 48.48 43.09

NPE-A Series Navien Circulation Pump
Flow (LPM) 0.00 5.00 7.58 10.00 11.37 15.00 20.00 25.00 30.00
Selection Criteria
Flow (GPM) 0.00 1.32 2.00 2.64 3.00 3.96 5.28 6.60 7.92
Head (PSI) 9.82 9.11 8.76 8.16 7.87 6.98 5.56 3.67 1.66
Head (FT) 22.68 21.04 20.24 18.85 18.18 16.02 12.94 8.48 3.83

The Leader in Condensing Technology

For Application Drawings, Specifications, CAD and Revit files, visit: navieninc.com/specs
Multiple NPE-A with External Recirculation Example Using Internal Circulators with External Building Recirculation Pump

Internal NPE-A circulators maintain tankless flow requirements, select external pump(s) to meet external piping requirements (head & flow).

Recommended Pipe Size/Heater Count

<table>
<thead>
<tr>
<th>1 Unit</th>
<th>2 Units</th>
<th>3 Units</th>
<th>4 to 6 Units</th>
<th>7 to 8 Units</th>
<th>9 to 14 Units</th>
<th>15 to 16 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/8&quot;</td>
<td>1&quot;</td>
<td>1-1/4&quot;</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2-1/2&quot;</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

NPE-A Series Tankless Water Heater

For Application Drawings, Specifications, CAD and Revit files, visit: navieninc.com/specs

Multiple NPE-S with External Recirculation Example Using an External Circulator

Suggested maximum flow is 3 GPM through tankless with a minimum flow of 2 GPM. Proper selection of external circulator requires meeting the external piping requirements (head & flow) pressure drops of NPE-S tankless water heaters. Select external circulator to pump 50% of total heater count @ 5 PSI pressure drop/12 ft. head.

Recommended Pipe Size/Heater Count

<table>
<thead>
<tr>
<th>1 Unit</th>
<th>2 Units</th>
<th>3 Units</th>
<th>4 to 6 Units</th>
<th>7 to 8 Units</th>
<th>9 to 14 Units</th>
<th>15 to 16 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/8&quot;</td>
<td>1&quot;</td>
<td>1-1/4&quot;</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2-1/2&quot;</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

NPE-S Series Tankless Water Heater

For Application Drawings, Specifications, CAD and Revit files, visit: navieninc.com/specs
Multiple NPE-S with Storage Tank Example

This drawing is intended only as a guide and not as a replacement for professionally engineered project drawings. The overall system drawing does not comply with local building codes. Actual installation may vary depending on installation location & parameters and it must be done in accordance to all local building codes. Verify with local building officials before commencement of system installation.

(A) Tankless Unit (before or after): Selected shall be 16 GPM Maximum @ 23' Total Head (11 PSI) + Pipe, Valves, Fittings & Tank.
(B) Install Circuit Setters to Maintain Flow into Units @ 4 GPM Minimum.

For Application Drawings, Specifications, CAD and Revit files, visit: navieninc.com/specs

Multiple NPE-S with Storage Tank Circulator Pump Sizing

<table>
<thead>
<tr>
<th>NPE-2405 Series Tankless</th>
<th>Pump Flow Requirements (b)</th>
<th>Manifold/ Pipe Size Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Navien NPE-2405 Heaters</td>
<td>4 GPM (26 head) (11 PSI)</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>1</td>
<td>8 GPM (26 head) (11 PSI)</td>
<td>1&quot;</td>
</tr>
<tr>
<td>2</td>
<td>12 GPM (26 head) (11 PSI)</td>
<td>1-1/4&quot;</td>
</tr>
<tr>
<td>3</td>
<td>16 GPM (26 head) (11 PSI)</td>
<td>1-1/2&quot;</td>
</tr>
<tr>
<td>4</td>
<td>20 GPM (26 head) (11 PSI)</td>
<td>2&quot;</td>
</tr>
<tr>
<td>5</td>
<td>24 GPM (26 head) (11 PSI)</td>
<td>2&quot;</td>
</tr>
<tr>
<td>6</td>
<td>28 GPM (26 head) (11 PSI)</td>
<td>2&quot;</td>
</tr>
<tr>
<td>7</td>
<td>32 GPM (26 head) (11 PSI)</td>
<td>2&quot;</td>
</tr>
<tr>
<td>8</td>
<td>36 GPM (26 head) (11 PSI)</td>
<td>2-1/2&quot;</td>
</tr>
<tr>
<td>9</td>
<td>40 GPM (26 head) (11 PSI)</td>
<td>2-1/2&quot;</td>
</tr>
<tr>
<td>10</td>
<td>44 GPM (26 head) (11 PSI)</td>
<td>2-1/2&quot;</td>
</tr>
<tr>
<td>11</td>
<td>48 GPM (26 head) (11 PSI)</td>
<td>2-1/2&quot;</td>
</tr>
</tbody>
</table>

(b) Additional pressure losses in plumbing between the Navien(s) and the storage tank or total piping of recirculation loop must also be taken into consideration and added. Flow rates and pressure drop requirements shown are calculated with all Flow Adjustment Valves programmed open.
### Navien NPE-S Series Tankless Water Heater with Storage Tank Circulator Selection Guide

<table>
<thead>
<tr>
<th>Navien NPE Unit Count</th>
<th>Unit Flow Rate</th>
<th>Total System GPM</th>
<th>Recommended Pipe Manifold Size</th>
<th>Grundfos</th>
<th>Taco</th>
<th>Bell &amp; Gossett</th>
<th>Armstrong</th>
<th>Wilo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>3/4&quot;</td>
<td>UPS36-060F, UPS36-090F</td>
<td>001-5SF4, 003-5SF3</td>
<td>NBF-36, PLC-30B &amp; 41B</td>
<td>E8.2B, E9.2B</td>
<td>STAR Z S21</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>1&quot;</td>
<td>UPS36-090F, UPS36-150SF</td>
<td>003-5SF3</td>
<td>PL-36B</td>
<td>E9.2B, E23.2B</td>
<td>STAR Z S21</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>1-1/4&quot;</td>
<td>UPS36-150SF, UPS36-200SF</td>
<td>2400-20S</td>
<td>FL-55B</td>
<td>E9.2B, E23.2B</td>
<td>STAR Z S33</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>1-1/2&quot;</td>
<td>UPS36-150SF, UPS36-200SF</td>
<td>2400-45S, 133B</td>
<td>FL-55B</td>
<td>E9.2B, E23.2B</td>
<td>STAR Z S33</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>1-1/2&quot;</td>
<td>UPS36-150SF, UPS36-200SF</td>
<td>2400-45S, 133B</td>
<td>FL-55B</td>
<td>E9.2B, E23.2B</td>
<td>STAR Z S33</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>24</td>
<td>2&quot;</td>
<td>UPS36-200SF</td>
<td>2400-55S, 133B</td>
<td>POD-40S</td>
<td>E22.2B</td>
<td>STRATOS Z 1250-36</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>28</td>
<td>2&quot;</td>
<td>UPS36-200SF</td>
<td>2400-55S, 133B</td>
<td>POD-40S</td>
<td>E22.2B</td>
<td>STRATOS Z 1250-36</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>32</td>
<td>2&quot;</td>
<td>UPS36-200SF</td>
<td>2400-55S, 133B</td>
<td>POD-40S</td>
<td>E22.2B</td>
<td>STRATOS Z 1250-36</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>36</td>
<td>2-1/2&quot;</td>
<td>UPS36-150SF, UPS36-200SF</td>
<td>2400-45S, 133B</td>
<td>POD-40S</td>
<td>E22.2B</td>
<td>STRATOS Z 1250-36</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>40</td>
<td>2-1/2&quot;</td>
<td>UPS36-150SF, UPS36-200SF</td>
<td>2400-45S, 133B</td>
<td>POD-40S</td>
<td>E22.2B</td>
<td>STRATOS Z 1250-36</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>44</td>
<td>2-1/2&quot;</td>
<td>UPS36-150SF, UPS36-200SF</td>
<td>2400-45S, 133B</td>
<td>POD-40S</td>
<td>E22.2B</td>
<td>STRATOS Z 1250-36</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>48</td>
<td>2-1/2&quot;</td>
<td>UPS36-150SF, UPS36-200SF</td>
<td>2400-45S, 133B</td>
<td>POD-40S</td>
<td>E22.2B</td>
<td>STRATOS Z 1250-36</td>
<td></td>
</tr>
</tbody>
</table>

Maximum Acceptable Pump Flow Rates per Unit 4 GPM

Suggested 115V/1 Ph. circulator models and sizes are for reference only. Proper verification of required sizes must be confirmed with specific installation and application.

Note; tankless units may be able to be split up into banks of heaters to allow smaller pump selections.

Contact Navien for technical assistance with applications requiring more than 12 NPE Series Heaters in Pump/Tank Applications.

### Commercial and General Tankless Application Sizing Using ASHRAE Modified Hunter Curve

Determine the total fixture unit load for all the fixtures serviced by your water heater application using the ASHRAE Modified Hunter Curve Hot Fixture Units Table.

Using the total fixture units for your application, enter the Hunter Curves using ASHRAE Modified Hunter Curve – Flow Chart (0-100 or 0-500) from the bottom on the total fixture units line for your application. Read up to the curve that best fits the application. Then read to the left for the corresponding GPM requirement.

Example: Apartment Building (50 Units, 25 1-Bath, 25 2-Bath)

<table>
<thead>
<tr>
<th>No. Fixtures</th>
<th>Type of Fixture</th>
<th>Fix. Unit</th>
<th>Demand Fix. Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>Private Lavatory</td>
<td>75</td>
<td>56.25</td>
</tr>
<tr>
<td>75</td>
<td>Tub &amp; Shower</td>
<td>75</td>
<td>112.5</td>
</tr>
<tr>
<td>50</td>
<td>Sink-Kitchen</td>
<td>1.5</td>
<td>37.5</td>
</tr>
<tr>
<td>50</td>
<td>Domestic Dishwasher</td>
<td>1.5</td>
<td>75</td>
</tr>
<tr>
<td>12</td>
<td>Domestic Clothes Washer</td>
<td>12</td>
<td>66</td>
</tr>
</tbody>
</table>

Total Fixture Units 342

Refer to the modified Hunter Curves in Chart(s) included on the next pages. Curve C represents apartments. Enter the graph from the bottom at 342 fixture units and go up to curve C. Then move to the left horizontally to read approximately 45 gallons per minute of hot water capacity required.

Determine temperature rise required based on coldest inlet water temperature (winter).

Example: 40°F inlet cold water heated to 140°F = 100°F rise

<table>
<thead>
<tr>
<th>°F Rise</th>
<th>GPM</th>
<th>°F Rise</th>
<th>GPM</th>
<th>°F Rise</th>
<th>GPM</th>
<th>°F Rise</th>
<th>GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>13.0</td>
<td>50</td>
<td>7.8</td>
<td>70</td>
<td>5.6</td>
<td>90</td>
<td>4.3</td>
</tr>
<tr>
<td>35</td>
<td>11.1</td>
<td>55</td>
<td>7.1</td>
<td>75</td>
<td>5.2</td>
<td>100</td>
<td>3.9</td>
</tr>
<tr>
<td>40</td>
<td>9.7</td>
<td>60</td>
<td>6.5</td>
<td>80</td>
<td>4.9</td>
<td>100</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Calculation: 199,900 BTU/H Input (NPE-240) / 8.34 (gal of water) / 60 (minutes) / 0.97 (efficiency) = 3.875 GPM

Using a temperature rise of 100°F, 45 GPM Apartment hot water requirement / 3.9 GPM per tankless = 12 NPE-240 Tankless Required.
Commercial and General Tankless Application Sizing with Storage

Using ASHRAE Modified Hunter Curve

1. Apply the Modified Hunter Curve to Fixture Count
2. Use Chart to Convert to GPM
3. Determine Coldest Incoming Water Temperature
4. Select Desired Storage Tank Outlet Temperature
5. Calculate the Temperature Rise
6. Multiply the GPM x (Temperature Rise) x 500 = BTU/H Required
7. Apply a Diversity Factor of .60
8. Divide BTU/H by 199,900 to Determine the Number of Navien NPE-240 Tankless Units Required

Sizing the Minimum Storage Tank Size

1. Total Number of Tankless Units Required Calculated Above Multiplied by 40 = Minimal Size of Storage Required in Gallons

Example: Apartment Building (50 Units, 25 1-Bath, 25 2-Bath)

<table>
<thead>
<tr>
<th>No. Fixtures</th>
<th>Type of Fixture</th>
<th>Fix. Unit</th>
<th>Demand Fix. Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>Private Lavatory</td>
<td>75</td>
<td>56.25</td>
</tr>
<tr>
<td>75</td>
<td>Tub &amp; Shower</td>
<td>1.5</td>
<td>112.5</td>
</tr>
<tr>
<td>50</td>
<td>Sink-Kitchen</td>
<td>75</td>
<td>37.5</td>
</tr>
<tr>
<td>50</td>
<td>Domestic Dishwasher</td>
<td>1.5</td>
<td>75</td>
</tr>
<tr>
<td>50</td>
<td>Domestic Clothes Washer</td>
<td>1.2</td>
<td>60</td>
</tr>
</tbody>
</table>

Total Fixtures: 342

Equipment Required: 7 NPE-240S & 280 Gallons of Storage
ASHRAE Modified Hunter Curve — Flow Chart (0–100)

[Graph showing the modified Hunter curve for flow rates ranging from 0 to 100 gallons per minute (GPM) and total fixture units ranging from 0 to 100.]

- Curve A - Restaurants
- Curve B - Hospitals, Nursing Homes, Dormitories, Hotels, Motels, Laundry
- Curve C - Apartments
- Curve D - Elementary & High Schools

Conversion Factor:

\[ \text{L/S} = \text{GPM} \times 0.0631 \]

Reprinted from the 1987 ASHRAE Handbook

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ASHRAE Modified Hunter Curve — Flow Chart (0–500)

[Graph showing the modified Hunter curve for flow rates ranging from 0 to 500 gallons per minute (GPM) and total fixture units ranging from 0 to 500.]

- Curve A - Restaurants
- Curve B - Hospitals, Nursing Homes, Dormitories, Hotels, Motels, Laundry
- Curve C - Apartments
- Curve D - Elementary & High Schools

Conversion Factor:

\[ \text{L/S} = \text{GPM} \times 0.0631 \]

Reprinted from the 1987 ASHRAE Handbook
Multiple NPE-240 (A or S) Common Venting

Additional model sizing & selection available online at NavienInc.com.

Determining the Length of a Common Vent System

Follow the instructions listed below to determine the length of a common vent.

1. Add the BTU/H input ratings for each unit in the cascading system to determine the total BTU/H rating.

2. Determine the total length (L) of the common vent, which consists of the horizontal width (W) and the vertical height (H): Total length (L) = W + H.

Navien Backflow Damper (Back-draft Damper) 30014367A

The Navien backflow damper prevents backflow (back-draft) at the exhaust vent while the water heater unit operates.

By closing the exhaust vent as soon as the combustion cycle ends, the Navien backflow damper retains heat in the system for longer periods. This improves the system’s thermal efficiency.

NOTE: When using a common vent in a cascade system, backflow devices are required to prevent exhaust from entering the building.

Included Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backflow Damper</td>
<td></td>
</tr>
<tr>
<td>Installation Manual</td>
<td></td>
</tr>
<tr>
<td>Ready-Link communication cable</td>
<td></td>
</tr>
<tr>
<td>Screw (4 ea)</td>
<td></td>
</tr>
</tbody>
</table>

Formulas

**General Formulas**

- **Horsepower Water** = \( \frac{GPM \times H \times \text{Specific Gravity}}{3960} \)
- **Horsepower Brake** = \( \frac{GPM \times H \times \text{Specific Gravity}}{1713 \times \text{Pump Efficiency}} \)
- **Efficiency (Pump)** = \( \frac{GPM \times H \times \text{Specific Gravity}}{3960 \times \text{Pump Efficiency}} \)
- **Brake Horsepower (Motor)** = \( \frac{\text{Watts Input} \times \text{Motor Efficiency}}{746} \)
- **Pressure (lbs./sq. in.)** = \( H \times \text{Specific Gravity} \)
- **Head (ft.)** = \( \frac{\text{Btu/sq. in.} \times 2.31}{\text{Specific Gravity}} \)
- **GPM** = \( \frac{\text{BTU/H}}{500 \times \Delta T (°F)} \)
- **\( \Delta T \) (°F)** = \( \frac{\text{BTU/H}}{500 \times GPM} \)
- **Pressure (PSI)** = \( H \times \text{Specific Gravity} \)
- **Head (ft.)** = \( \frac{\text{Pressure (PSI)} \times 2.31}{\text{Specific Gravity}} \)

**Water Heating Formulas**

- **% Efficiency** = \( \frac{\text{BTU/H}}{\text{GPM} \times 0.34 \times \text{Temp. Rise} \times 1.0 \times \text{Specific Heat}} \)
- **BTU/H Output** = \( \frac{\text{BTU/H Input}}{\text{GPM} \times 0.34 \times \text{Temp. Rise} \times 1.0} \)
- **BTU/H Input** = \( \frac{\text{GPM} \times 0.34 \times \text{Temp. Rise} \times 1.0}{\% \text{ Efficiency}} \)
- **GPH** = \( \frac{\text{BTU/H Input}}{\text{Temp. Rise} \times 0.34} \)
- **Rise (DF)** = \( \frac{\text{BTU/H Input}}{\text{GPM} \times 0.34} \)
- **KW** = \( \frac{\text{GPM} \times 0.34 \times \text{Temp. Rise} \times 1.0}{3413} \)

**Determine % of Hot Water Portion**

- \( \frac{\text{H} - \text{MNT}}{\text{H} - \text{C}} \) = \( \frac{140 - 50}{180 - 150} \) = \( \frac{90}{130} \) = 69.2% Hot Water

**Determine % of Cold Water Portion**

- \( \frac{\text{MWT} - \text{C}}{\text{H} - \text{C}} \) = \( \frac{180 - 50}{180 - 150} \) = \( \frac{130}{130} \) = 30.8% Cold Water

**Fluid Velocity Formulas**

- **Velocity (ft./sec.)** = \( \frac{408 \times \text{GPM}}{(\text{Pipe Diameter in Inches})^2} \)
- **Velocity Head (ft.)** = \( \frac{(\text{Pipe Velocity} \times \text{ft./sec.})^2}{914} \)
### Navien NPE-240 (A or S) Tankless Water Heater Gallons Per Minute @ Temperature Rise

<table>
<thead>
<tr>
<th>Temp rise (°F)</th>
<th>22 series GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>11.2</td>
</tr>
<tr>
<td>40</td>
<td>8.8</td>
</tr>
<tr>
<td>45</td>
<td>8.7</td>
</tr>
<tr>
<td>50</td>
<td>7.8</td>
</tr>
<tr>
<td>55</td>
<td>7.1</td>
</tr>
<tr>
<td>60</td>
<td>6.5</td>
</tr>
<tr>
<td>65</td>
<td>6.0</td>
</tr>
<tr>
<td>70</td>
<td>5.6</td>
</tr>
<tr>
<td>75</td>
<td>5.2</td>
</tr>
<tr>
<td>80</td>
<td>4.9</td>
</tr>
<tr>
<td>85</td>
<td>4.6</td>
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<tr>
<td>90</td>
<td>4.4</td>
</tr>
<tr>
<td>100</td>
<td>3.9</td>
</tr>
<tr>
<td>110</td>
<td>3.5</td>
</tr>
<tr>
<td>120</td>
<td>3.3</td>
</tr>
<tr>
<td>130</td>
<td>3.0</td>
</tr>
<tr>
<td>140</td>
<td>2.8</td>
</tr>
</tbody>
</table>

### Specifications

**Model**
- NPE-150S
- NPE-160A
- NPE-180S
- NPE-210A
- NPE-210S
- NPE-240A
- NPE-240S

#### Heat Capacity
- Natural gas: 15,000–120,000 BTU/H
- Propane gas: 15,000–120,000 BTU/H

#### Efficiency Ratings
- UEF (NG & LP): 0.96

#### Flow Rate (30°F)
- 22°F (°C) temp rise: 3.2 GPM (12 L/m) @ 45°F (25°C) temp rise: 4.3 GPM (16 L/m)
- 22°F (°C) temp rise: 4.2 GPM (16 L/m) @ 45°F (25°C) temp rise: 5.0 GPM (19 L/m)

#### Dimensions
- 17.3"W x 27.4"H x 13.2"D

#### Weight
- 55lbs (25kg)
- 75lbs (34kg)
- 67lbs (30kg)
- 82lbs (37kg)
- 75lbs (34kg)
- 82lbs (37kg)
- 75lbs (34kg)

#### Installation Type
- Indoor or outdoor wallhung

#### Venting Type
- Forced draft direct vent

#### Ignition
- Electronic ignition

#### Water Pressure
- 15–150 PSI

#### Natural Gas Input Pressure
- 3.5"–10.5" WC

#### Propane Gas Input Pressure
- 8"–13" WC

#### Water Temperature High Limit Switch
- 120°F (49°C)

#### Excess Air
- 0.01 GPM (0.04 L/m)

#### Connection Sizes
- Cold water inlet: 3/4" NPT
- Hot water outlet: 3/4" NPT
- Gas inlet: 3/4" NPT

#### Electrical Requirements
- Main supply: 120V AC, 60 Hz
- Maximum power consumption: 200W (max 2A), 350W (max 4A) with external pump connected

#### Materials
- Casing: Cold rolled carbon steel
- Heat exchangers: Primary heat exchanger: stainless steel, secondary heat exchanger: stainless steel
- Valve: 1/2" or 3/4" PVC, CPVC, polypropylene / 1/2" or 3/4" special gas vent type BH (Class II, A/B/C)

#### Venting
- 0" to combustibles

#### Safety Devices
- Flame rod, APS, ignition operation detector, water temperature high limit sensor, power surge fuse

*Navien reserves the right to change specifications at any time without prior notice.

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### Notes

- Available for "A" models configured in an optional ComfortFlow recirculation mode. Additional energy use will occur when using recirculation.
- Please refer to www.navien.com to verify you have the most current information.