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650 HP FIRETUBE BOILER

Maximum BTU/hr Input (ie: Rated Input @ High Fire / 100% Input Rating)	$650 \times 42,000 = 27,300,000 \text{ BTU}$
Cubic Feet of Natural Gas Required	$27,300,000 \div 1,000 = 27,300 \text{ Cu Ft}$
Cubic Feet of Vaporized Propane Required	$27,300,000 \div 2,500 = 10,920 \text{ Cu Ft}$
Gallons of Liquid Propane Required	$27,300,000 \div 91,600 = 298 \text{ Gallons}$
Gallons of #2 Diesel Oil Required	$27,300,000 \div 140,000 = 195 \text{ Gallons}$
Minimum BTU/hr Input at a 4:1 Turndown Ratio (Low Fire)	$27,300,000 \div 4 = 6,825,000 \text{ BTU}$
Cubic Feet of Natural Gas Required	$6,825,000 \div 1,000 = 6,825 \text{ Cu Ft}$
Cubic Feet of Vaporized Propane Required	$6,825,000 \div 2,500 = 2,730 \text{ Cu Ft}$
Gallons of Liquid Propane Required	$6,825,000 \div 91,600 = 74.5 \text{ Gallons}$
Gallons of #2 Diesel Oil Required	$6,825,000 \div 140,000 = 48.75 \text{ Gallons}$
Maximum Steam Production in lbs/hr (High Fire)	$650 \times 34.5 = 22,425 \text{ lbs/hr}$
Maximum Water Evaporation Rate	$650 \times .069 = 44.85 \text{ GPM}$
Minimum Feedwater Pump Flow (on / off pump strategy)	$44.85 \times 2 = 89.7 \text{ GPM}$
Minimum Feedwater Pump Flow (modulating pump strategy)	$44.85 \times 1.5 = 67.27 \text{ GPM}$
Minimum Feedwater Tank Storage Requirement	448.67 Gallons
Steam Temperature at <u>70 psi</u> Saturated	316.25 °F
BTU/hr Output, Based on 80% Efficiency at High Fire	$27,300,000 \times .80 = 21,840,000 \text{ BTU}$
BTU/hr Output, Based on 80% Efficiency at Low Fire	$6,825,000 \times .80 = 5,460,000 \text{ BTU}$
Square Feet Heating Surface (sq. ft. HS) at 5 sq. ft. per HP	$650 \times 5 = 3,250 \text{ Sq Ft}$
Minimum Steam Safety Relief Valve Capacity at Boiler Design	$22,425 \times 1.10 = 24,667.5 \text{ lbs/hr}$
Minimum Water Softener Flow Capacity at High Fire (always based upon 100% input)	$44.85 \times 2 = 89.7 \text{ GPM}$

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