Information you need to have going in…

Process – Will you be a tasting room, brewpub, or distributing brewery? Have you decided on a particular brewing process? What types of beers do you plan to produce? How do you want to heat the brew house? Make sure that the proposed brewhouse will be capable of supporting your desired brewing procedure.

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Production Capability - How much beer do you plan to make per week/month/year?

_____

Brewery Site –

Ceiling and/or doorway restrictions? Will you have to open the roof or wall to get that system into the building?

Electrical availability- existing and upgrade cost/potential

Gas availability - existing and upgrade cost/potential

Water meter and pipe size – cost to upgrade to a larger meter, if needed?

Floor (concrete, tile, wood, etc.) – ability to install sloped floors; compatibility with your heat source

Space available for brewing equipment

Brewhouse Configuration - The potential output of the brewhouse will be determined by this configuration. Establish the length of time needed to do one brew as well as the time needed to do multiple brews in succession (if applicable). Does the system only do one brew at a time or will it be possible to have two, or even three, brews in progress at one time? Can the system be modified for future production increases? How important is the ability to expand?

There are many different brewhouse configurations. Common ones include:

a) Mash/Lauter Tun, Kettle/Whirlpool (2 vessels)

b) Mash/Lauter Tun, Kettle, Whirlpool Tank (3 vessels)

c) Mash Tun/Kettle, Lauter, Whirlpool Tank (3 vessels)

d) Mash Tun, Lauter Tun, Kettle, Whirlpool Tank (4 vessels)

e) Additionally, you will likely want a hot liquor tank and may also require a cold liquor tank in each of the above configurations.

The next determination is the size of the system. 3 bbl, 7 bbl, 14 bbl, 20 bbl, 30 bbl, 50 bbl ……100 bbl. For a production brewery, a 20 bbl system capable of three brews a day working 360 days can at

best make 21,500 bbls of beer. A ten day fermentation tank turnover time means 600 bbls of fermentation tank will be needed. Packaging 5 days a week for 50 weeks will require almost 90 bbls a day to be processed.

(In my opinion, unless someone has cash in the bank, and can afford to invest with negative to zero return for years, they should not buy a system looking too far in advance – better to get a system that will meet your needs for the initial 2 to 4 years, then expand if needed – many a brewer have gone under due to having too large a system and they can't support it financially – and they'll risk having beer go bad because they can't sell it fast enough in the beginning, further dooming their venture).

Four daily brews is a potential production of 28,800 bbls. Five brews daily and you are up to 36,000 bbls. Another consideration can be whether you want to run 24 hours a day or only two shifts.

Brewpubs and tasting rooms will focus more on variety and less on quantity. The brewery size for a brewpub or tasting room is a balance between annual volume and number of brews on tap at a given time.

Tank sizes also need to be determined. Fermenters are often sized for single brews, but it is very useful to also have fermenters capable of holding two or three brews. The "footprint" of space needed for a 40 bbl or 60 bbl tank is not much more than that of a 20 bbl tank. Larger tanks save space and cost less per barrel to purchase. Smaller tanks increase the number of different recipes that can be in progress.

Aging tank size (for lager breweries) is largely determined by the fermenter sizing.

Brite tank size is determined by a combination of fermenter and/or aging tank size with the volumes planned for daily packaging. Plan on at least one brite tank for every flavor you expect to package in a single day. If you are canning or bottling, set up time can be significant, so the more flavors or barrels you can fill in one day, the better.

By example a 30 bbl brewhouse combines well with 30 bbl, 60 bbl, and 90 bbl fermenters. Having a 30 bbl and a 60 bbl brite tank will then allow for processing any of the fermenters and provide for some packaging flexibility. You should roughly expect to turn a brite tank over no more than once per day.

Make sure the starting tankage is appropriate for your goals. Establish a workable plan to add additional tanks for future growth, including their size and where they can be located.

For comparison here are two examples that show some of the different needs of breweries.

Example One, A Brewpub - Where you want many different beers on tap, using a very limited space. The space limitations often make it necessary for a brewpub to acquire all of its tankage day one, with expansion possible only through using lots of racking to kegs.

Initial	Brewhouse, 4 fermenters, 4 brite tanks, some kegs
1 year	Brewhouse, 4 fermenters, 4 brite tanks, lots of kegs
2 years	Brewhouse, 6 fermenters, 4 brite tanks, more kegs
2 years	Brewhouse, 6 fermenters, 8 brite tanks, more kegs
3 years	maybe double size fermenters, and lots more racking

Example Two, A Production Brewery – Where you should have more space to add tanks, and probably will have fewer active recipes in progress at any given time.

Initial	Brewhouse, 2 single batch fermenters, 2 double, 1 brite tank, kegs
1 year	Brewhouse, more fermenters, aging tanks (if lagering), 2nd brite tank, kegs
2 years	A 3rd brite tank, more fermenters, aging capacity, and kegs
3 years+	More fermentation and aging capacity, and more kegs

So we now have the system size and configuration established as well as the initial fermentation, aging, and brite capacities. Now we can establish the rest of the equipment.

1) **Grain Handling**
   a) The mill
   b) An arrangement to add malt to the mill.
   c) An arrangement to move the malt to the mash tun.
      This can incorporate a grist tank to allow milling in advance of a brew and to speed up mashing in.
   d) Dust control?

2) **Water**
   a) **Hot Liquor Tank**
   b) **Cold or Ambient Water Tank** (optional, depends on your local water temperatures)
   c) **Water Purification System**.
      Particle, carbon, sterile, reverse osmosis, pH adjusting, softening… Look closely at your water supply and decide what if anything is needed. This will probably not come as part of the system but will be an add-on. A local supplier that can service it will usually be the best choice.
   d) **Heat Source** for the water and kettle.
      Flame, steam, electric, on demand, combinations? Who is responsible for the steam boiler?

3) **The Brewhouse**
   Mash, Lauter, Kettle, Whirlpool functions. Determine the need for venting the tuns and kettle to the outside and who will supply the vent installation.

4) **Cooling**
   a) Brewhouse - The heat exchanger configuration. 1 stage or 2 stage? Water, Cold water, glycol, other?
   b) Cold water tank? Is one needed or not? Jacketed? External heat exchanger?
   c) Heat recovery options with the cooling step, primarily hot water retention in the hot liquor tank.

5) **Glycol System**
   a) Capacity. Is it large enough to cool the brews, hold the fermenter temperatures then crash cool them, and keep the brite tanks at 32-38 degrees – all at the same time? (Although, it is common to shut the glycol supply off to the jacketed tanks during knock out with a 2-stage heat exchanger). Will it allow for additional tanks and expansion, if needed?

b) Installation. Who will install the chiller unit? Who will install the piping to the brewhouse and to the tankage? What materials will be used for the piping to the tanks? What size piping for the header? What quality of insulation?
c) Glycol. Size of reservoir. Who buys the initial charge of propylene glycol?
d) Temperature Control System. How will the tank temperatures be sensed and controlled? Will there be a central panel or controls at each tank? Which brands of controllers? What types of valves will control the glycol flow – solenoids, motor drives, other? And is the control system and piping network expandable?

6) Spent Grain Removal

a) How will the spent grain be removed from the lauter tun? Will a chute with an auger system be provided?
b) How will the spent grain be removed from below the lauter tun trap door?
c) Where will the spent grain go? Will it be sent to a trash can, a trailer outside, or a spent grain tank? How long will the auger need to be?
d) Will the spent grain removal system be compatible with your location? It can be quite a nuisance in the parking lot. Access, odors, flies, drainage……. These often are afterthoughts and can be major headaches later.
The layout of the brewery needs to consider the positioning of truck access, the glycol chiller, grain silos, bulk CO2 tanks, spent grain removal, public parking and access, etc. and to make sure they are as compatible as possible.

7) Tankage

a) **Fermenter considerations** –
- Are the specifications good?
- Types and thicknesses of stainless steel, pressure ratings for the glycol jackets (30 PSI is advised), pressure ratings for the fermenters themselves. (You do not want to have to deal with tank or jacket failures, or with rusting.)
- Is the CIP setup sufficient and safe?
- Cone bottom for yeast removal or dish bottom?
- Type and placement of door?
- Sanitary sampling valve?
- Racking arm?
- Venting?
- Overpressure and vacuum protection?
- Pressure gauge?
- Thermowell locations not affected by yeast buildup?
- What valves come with each tank?
- Where can you obtain replacement door gaskets?

b) **Aging Tanks** - For lagers. Same considerations as the fermenters without the same need for a cone bottom.

c) Brite Tanks
- These may need a higher pressure rating than do fermenters. You will want to be able to safely hold 15 to 30 PSI headspace pressure (if the beer is cold enough, then 15 psi will work). Suppliers will charge extra for a 30 psi rated tank. Your cellar people may want to operate the brite tank at the higher pressure. The liability of a

tank failure with resulting injuries makes the certification important. Insurance may not cover a tank being knowingly used outside its pressure specifications.

- Brite tanks need to have a cooling jacket on the bottom of the tank so that the temperature of the beer can be maintained at any fill level. They should have a sight glass so that the fill level can be monitored. They should come with a manway, valves, pressure gauge, carbonating stone, sanitary sampling port, and thermowell.

8) **Filter**

The type and size of the filter needed is affected by the size of the system, brewing processes, and serving methods.

a) A leaf plate diatomaceous earth filter is probably the most versatile and cost effective option for a brewery large enough to utilize it. A membrane filter can be used in conjunction with it if a sterile filtration is desired.
b) Pad filters. Buying pads, set up, and cleaning. These are more work and expense, but are better suited to smaller systems.
c) Lenticular filter. Elements are available for coarse through sterile filtrations
d) Other filter types such as ceramic, membrane…
Make the supplier convince you of the merits of the filter they want to provide so you can insure it is best for your purposes.

9) Miscellaneous

a) **CIP system**. Larger systems often have automated equipment to handle the chemicals used for cleaning the brewhouse and tanks. They may have it tied in with a brewhouse cleaning regime, especially to the cleaning of the heat exchanger between brews. This may be an option that does not come with a standard package and will require negotiation if wanted. This is different than the CIP equipment that come standard in each vessel. Small to medium breweries will use the dirty portable pump and hoses used for the transfer to CIP the tank.
b) **Portable Pumps**. A centrifugal pump on a wheeled cart is used for tank cleaning and some beer movements. They are an indispensable part of every brewery. Having two is much better than one. A spare makes maintenance much easier. Leaking seals can be dangerous?? and can quickly ruin a beer via oxygen exposure. Ask for spare seals and make sure the brand of pump is one that you can get repair parts for.
c) **Fittings and clamps**. Tees, elbows, triclamps, gaskets... You can never have too many. Setting up for cleaning just one tank can require several tees, elbows, and many valves. To arrange for draining the tank, water flushing or cleaning different parts of the tank without excess operator exposure to chemicals can call for some elaborate arrangements. Talk to your brewer. He can give you an idea of how many will be needed at a minimum.
d) **Hoses.** Sanitary beer hoses with triclamp connectors are not inexpensive. Make sure you get enough to operate the brewery without constantly moving hoses. The brewhouse will need a dedicated hose that will reach the fermenters. The filter will need two hoses; one between the fermenter and filter and one to reach the brite tank. Tank cleaning will require several shorter hoses; tank to pump, pump outlet to tank, one to bring rinse water, and one to the drain. More hoses will be needed for racking or bottling. And somebody probably just ran over one with the forklift!

Other fittings. Hose barb to triclamp fittings for CO2 movement and flushing. An industrial hose to triclamp fitting is very useful. You will want to have water available in the cellars via both industrial hose

connections and through triclamp connections. The industrial hoses are useful for washdowns, but triclamp connections are better for the tank cleanings and line flushes. The triclamp connections will require more valves and gaskets.

e) **Other misc**. A sanitary liquid meter is a useful tool to have in conjunction with tank filling and filtering. The brewhouse will need an apparatus for adding either sterile air or oxygen to the wort prior to the filtration. Oxygen tanks and gas flow regulators can be sourced through welding supply companies if not supplied with the system.

f) **Lab Equipment**. You will probably need to find your own lab equipment, but your turnkey supplier may offer this. At a minimum you will need hydrometers for the brewhouse, a CO2 volume tester to be able to measure the carbonation level in the brite tank, and equipment to be able to follow the health of your yeast. Yeast care will at minimum call for a microscope, a method to determine yeast viability, and a method to determine yeast cell counts for repitching. The list of desired lab equipment can grow quickly to include pH meters, thermometers, bacterial plating equipment, centrifuges, spectrophotometers, bitterness and alcohol testing, dissolved oxygen, etc., etc. There have been impressive advances in lab technology. Affordable, instant tests are available for checking bacteriological contaminations that would have been science fiction only a few years ago.

10) **Keg Washing and Fill**.

There is a lot of different equipment available for keg washing and filling. The degree of automation varies tremendously. There are choices on the chemicals used to clean and sterilize the kegs, or even to utilize steam. The cost and value of this equipment varies considerably. You will need to do your homework on the particular equipment offered by the supplier. Determine its true value and whether it will have the proper support for servicing. The keg equipment may be an item it is better to outsource.

11) **CO2**

Bulk CO2 tanks are usually obtained in lease agreements with CO2 suppliers. You will want to make sure the brewery layout includes a safe location for CO2 storage. Plan for CO2 lines to the cellar for maintaining head pressure in the fermenters, for the filter, brite tanks, and racking. Regulators will be needed. High capacity regulators that resist icing up are helpful at the brite tanks for carbonation. Ask the turnkey supplier if they will supply CO2 regulators for the Brite tanks. An ideal carbonation arrangement will include a regulator for the headspace CO2 being vented in addition to the one controlling the CO2 flow to the carbonating stone.

12) **In Summary**.

Get everything in writing!

- Make sure all of the equipment to be provided is properly listed, including the specifications ensuring the quality of the equipment such as the grades and thicknesses of stainless steel. Be picky. Don't be afraid to specify exactly the brand of temperature controllers, solenoids, or even clamps.
- Make sure all of the support services to be provided are listed. Have a listing of your responsibilities included as well. Eliminate the opportunities for misunderstanding or disagreement.
- Proper documentation of the installation agreement, support services, and equipment to be provided is important as it is your best guarantee that you will get the system you have

been promised and are paying for. If the installation goes badly these documents will be your lawyer's best weapon.

- Make sure the payment plan for the system is reasonable. It should reflect the progress of the project. Do not overtrust by overpaying early on. The actual presence of equipment is your first receipt of a tangible asset. Before that you are relying largely on trust and supplier reputation. Escrow accounts can protect the supplier and ease their concerns but be careful on how payments are triggered and authorized.
- Insist on some kind of protection from the perils of an overlong delivery and delayed installation. Penalty clauses and/or having a relatively large portion of the overall bill being paid only at the completion of the install can do this, but may be difficult to obtain from established suppliers.
- Keep your brewer involved in the design of the brewery, the equipment specifications, and in the installation. Brewer input can prevent many problems from occurring. It also helps by ensuring the brewer is knowledgeable and comfortable with the brewery, which in turn increases the probability that the brewer will make flawless brews.
- A last consideration - Invite me over for a beer or six when you have most of the kinks worked out. Please.

Supplier References.

Every business has detractors but it's always good to get a heads up from your fellow brewers.

Reference Breweries

_____ _____

_____ _____

Payment Structure – Are the payments triggered by agreed upon milestones in the construction phase, such as the equipment shipping or arriving to the site? How much is required in advance? Is the appropriate amount of the payment due as the project is nearing completion? The supplier will typically want to avoid a negative cash flow situation during the project.

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Penalty Clause - Is the supplier willing to include a penalty clause in the contract for failure to meet delivery times. Penalty clauses do not have to be punitive. If a company is promising delivery in 12 weeks, then requesting price concessions after 18 or 20 weeks is reasonable. Solid suppliers should be able to work with you to structure a reasonable agreement that will ensure a timely delivery yet safeguard both of your companies financially. Companies unwilling to consider a penalty clause could have difficulty meeting promised delivery times. If you ask for a penalty clause, in return a supplier might ask for a bonus for meeting or beating a promised delivery date or some other desirable goal.

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Support - What support will be provided in the installation? Nail down exactly what is being offered. In writing. (Truck unloading, Equipment Movement and Assembly, Tank Leveling, Glycol pipe installation, etc.)