



NZ DISTILLERY DESIGN AND SETUP GUIDELINES

PART 1- INTRODUCTION AND PROCESS OVERVIEW

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REVISION HISTORY

REVISION N°	PREPARED BY	ENTITY	DESCRIPTION	DATE
A	Liam Potts	Beca	Draft: For Discussion	10/09/2021
B	Rhys Kevern and Nicole Rubio	Beca	Draft: For Discussion (Food Safety section and associated appendices added)	24/03/2022
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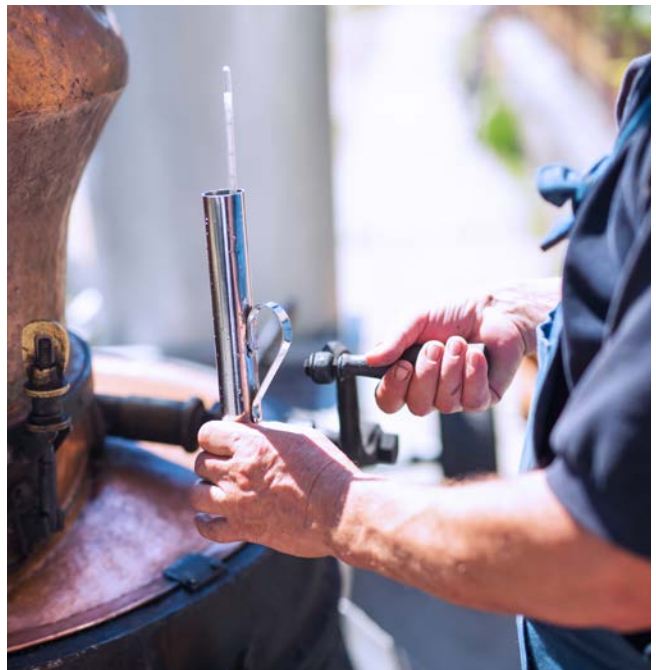
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1. INTRODUCTION

1.1. DISTILLERIES

1.1.1. General

Distilleries produce numerous spirits such as whisk(e)y, gin, vodka, rum, tequila and many more. There are many regulations relating to the production of alcohol such as excise licensing, sale of alcohol licensing, zoning of an activity within a city; environmental effects such as odour, chemical discharges and spill containment; safety of the processes due to flammable vapours being present, installation of utilities, storage and transport of flammable liquids, food safety etc. This guideline is intended to introduce the applicable regulations related to the production of alcoholic spirits and provide either examples of the types of documentation required for each facet or provide links to further information on the issue.



1.2. AUTHORS

1.2.1. Distilled Spirits Aotearoa

Distilled Spirits Aotearoa represents a group of distilled spirits manufacturers and associated groups and individuals, passionate about promoting our New Zealand-made products and representing the joint interests of all NZ makers of distilled spirit products.

1.3. SUMMARY OF REGULATIONS REVIEWED

The Regulations reviewed for this guideline and their requirements are summarised in Table 1-1.

TABLE 1-1 RELEVANT REGULATIONS

TOPIC	COVERAGE	LEGISLATION / STANDARDS
Production and sale of alcohol	A Customs Controlled Area licence is required to manufacture alcohol commercially. Excise duty is charged monthly initially on a pure alcohol basis on the amount of alcohol that leaves the premises. If you make alcohol and need to store it in another location, you must apply for an off-site storage licence. The off-site storage area can be in a different geographical area. Sale of alcohol at the premises or on-line requires a liquor licence and there are specific requirements relating to remote sales. An on-licence, off-licence, or club licence is granted initially for one year and then can be renewed every three years.	<ul style="list-style-type: none"> • Customs and Excise Act 2018 • Sale and Supply of Alcohol Act 2012 • Sale and Supply of Alcohol Regulations 2013
Land-use planning	There are restrictions on where certain activities can occur in specific zones, i.e. alcohol production would be best undertaken in an industrial zone. There are rules for permitted activities so you can potentially undertake a certain activity without a resource consent as long as you can meet the general requirements such as building height, noise, distances to boundaries etc. If a land-use consent is required, this can be applied for from the local Council but it is easier to find a location for the operation that meets the permitted conditions.	City or District Council Plan zones and rules related to the Resource Management Act 1991
Environmental	Alcohol and cooking grain odour can cause a nuisance to neighbouring activities. If the process is heated by a boiler then there are limitations on the fuel, heat output and chimney configuration under air quality rules. If it is expected that effluent will be discharged to the local wastewater treatment plant then a trade waste permit may be required. Spill response is often required by Councils and as part of hazardous substance management. An environmental consent has a fixed term and compliance charges payable every year.	Regional plan rules especially air and water discharges related to the Resource Management Act 1991. There are tradewaste limitations on quantities and properties of waste going to the local wastewater treatment plant.

TOPIC	COVERAGE	LEGISLATION / STANDARDS
Health and safety	<p>A company (or PCBU) has an obligation to maintain the safety of personnel, and there can be fines for not providing a safe working environment. There are a range of hazards associated with Alcohol production such as the following:</p> <ul style="list-style-type: none"> • Flammable ethanol and mixtures of ethanol with water (burns from fire, explosion) • Combustible dusts (burns from fire, explosion) • Carbon dioxide from fermentation (causes asphyxiation) • Pressure containing equipment (explosion) • Hot surfaces (burns) • Cleaning chemicals & other hazardous substances (toxic, burns) • Rotating machinery (entanglement, pinching, crushing) • Transportation - forklifts, truck movements (physical injury) • Noise (hearing damage) • Any significant health and safety incidents need to be report to WorkSafe NZ. 	<ul style="list-style-type: none"> • Health and Safety at Work Act 2015
Hazardous substances including hazardous areas	<p>Alcohol is a flammable substance and therefore can be ignited by sources such as open flames, electrical installations etc.</p> <p>An inventory of hazardous substances needs to be maintained on-site and incompatible substances stored separately. Staff working with hazardous substances need to have minimum training which includes understanding safety data sheets, emergency response and evacuation and spill response drills need to be done at least annually, preferably 6 monthly. Hazardous substances need to be labelled to identify the substance and its associated hazards. There are limits on storage quantities of hazardous substances and the type of storage allowed depending on the hazard rating. Alcohol manufacturers need to be able to provide a safety datasheet (SDS) for their product. An example SDS is attached as Appendix E.</p>	<ul style="list-style-type: none"> • Hazardous Substances and New Organisms Act 1996 • Health and Safety at Work (Hazardous Substances Regulations) 2017 • AS/NZS 60079.10.1:2009 - Explosive atmospheres - Classification of areas - Explosive gas atmospheres • AS/NZS 60079.10.2:2016 - Explosive atmospheres - Part 10.2: Classification of areas - Explosive dust atmospheres • AS/NZS 60079.14:2017 - Explosive atmospheres - Part 14: Design selection, erection and initial inspection • AS/NZS 60079.17:2009 - Explosive atmospheres - Electrical installations inspection and maintenance

TOPIC	COVERAGE	LEGISLATION / STANDARDS
		<ul style="list-style-type: none"> AS 1940:2017 - The storage and handling of flammable and combustible liquids NFPA 30 - Flammable and Combustible Liquids Code
Transport Regulations	<p>Transport of alcohol in containers less than 250 L is exempt from the UN packaging regulations on strength of the container however transport by sea may require supply of a safety data sheet and a dangerous goods declaration.</p>	<ul style="list-style-type: none"> Land Transport Act 1998 Land Transport Rule - Dangerous Goods 2005 NZS 5433:2020 - Transport of dangerous goods on land
Buildings and Utilities	<p>Commercial buildings have a warrant of fitness which requires specific fire control systems to be in place. The production of alcohol will increase the fire risk of the building and consequently its use category. Building alterations are likely to require a building consent. It is preferable to have a building that has purpose-built rooms for dealing with flammable substances such as fire rated stores. For food safety, the ease of being able to clean the rooms and minimise physical contamination in raw materials or finished product is important. Gas and electrical installations need to be installed, modified and maintained by appropriately certified tradespeople.</p>	<ul style="list-style-type: none"> Building Act 2004 Building Regulations 1992 DISCUS - Recommended Fire Protection Practices for Distilled Spirits Beverage Facilities Electricity Act 1992 Electricity (Safety) Regulations 2010 Gas Act 1992 Gas (Safety and Measurement) Regulations 2010 NZS 5255:2014 - Safety verification of existing gas installations AS/NZS 5601.1:2013 - Gas installations - Part 1: General installations
Food Safety	<p>Safety of food is important to prevent bacterial, chemical or physical contamination of the food material produced. The Ministry of Primary Industries requires the manufacture of alcohol and its associated food safety plan to be registered with them or the local Council under national programme 3 (NP3) which requires specific food safety requirements to be documented and verified externally. The programme is audited 2 yearly and is also reregistered every 2 years.</p> <p>Food defence against bioterrorism is also becoming an important issue.</p>	<ul style="list-style-type: none"> Food Act 2014 Food Regulations 2015 A food safety plan such as NP3 or a HACCP plan, or to a high level, ISO 22000:2018 - Food safety management systems – Requirements for any organization in the food chain

2. TYPICAL ALCOHOL PRODUCTION PROCESS

Alcohol is primarily produced from a cooked starch or direct sugar source such as grain that has either been milled or malted (soaking the grains to induce germination), sugar or fruit etc which is then fermented with yeast. The source of sugar, and the resulting spirit created is as wide as the world's starch sources are diverse and the production of alcohol has been practised over millennia.

Some distillers begin their craft utilising potable ethanol as a base from which to build complex flavours (e.g. when making gin) while others will make and concentrate the spirit from grain fermentation.

In order for fermentation to occur, two components are required:

1. a material that contains sugar that yeast can metabolise;
2. and yeast.



The yeast metabolises sugar which produces carbon dioxide and alcohol. The alcohol is separated from this mixture via distillation.

Alcohol produced by fermentation is typically weak, between 4 & 13 % Alcohol by Volume (ABV). Distillation is used to separate alcohol from the fermentation liquor (or Wash) by boiling and collecting it by condensation. The difference in vapour pressure and consequently the boiling points of water and alcohol are such that the alcohol boils off the liquor leaving most of the water behind and therefore concentrating the alcohol once it is condensed back to a liquid. Distillation also recovers delicate volatiles from the fermentation liquor that provide organoleptic characteristics to the alcohol produced (i.e. taste, smell or texture).

This following discussion covers the production of a range of spirits and is sourced from the United States Environmental Protection Agency (USEPA) Air pollution emission factors 9.12.3 Distilled Spirits and Implementation of Hazard Analysis Critical Control Point (HACCP) System referred to in Figure 2-1. Figure 2-1 is a process flow diagram of a typical range of spirit production processes. Note: CCP stands for critical control point under a food safety programme.

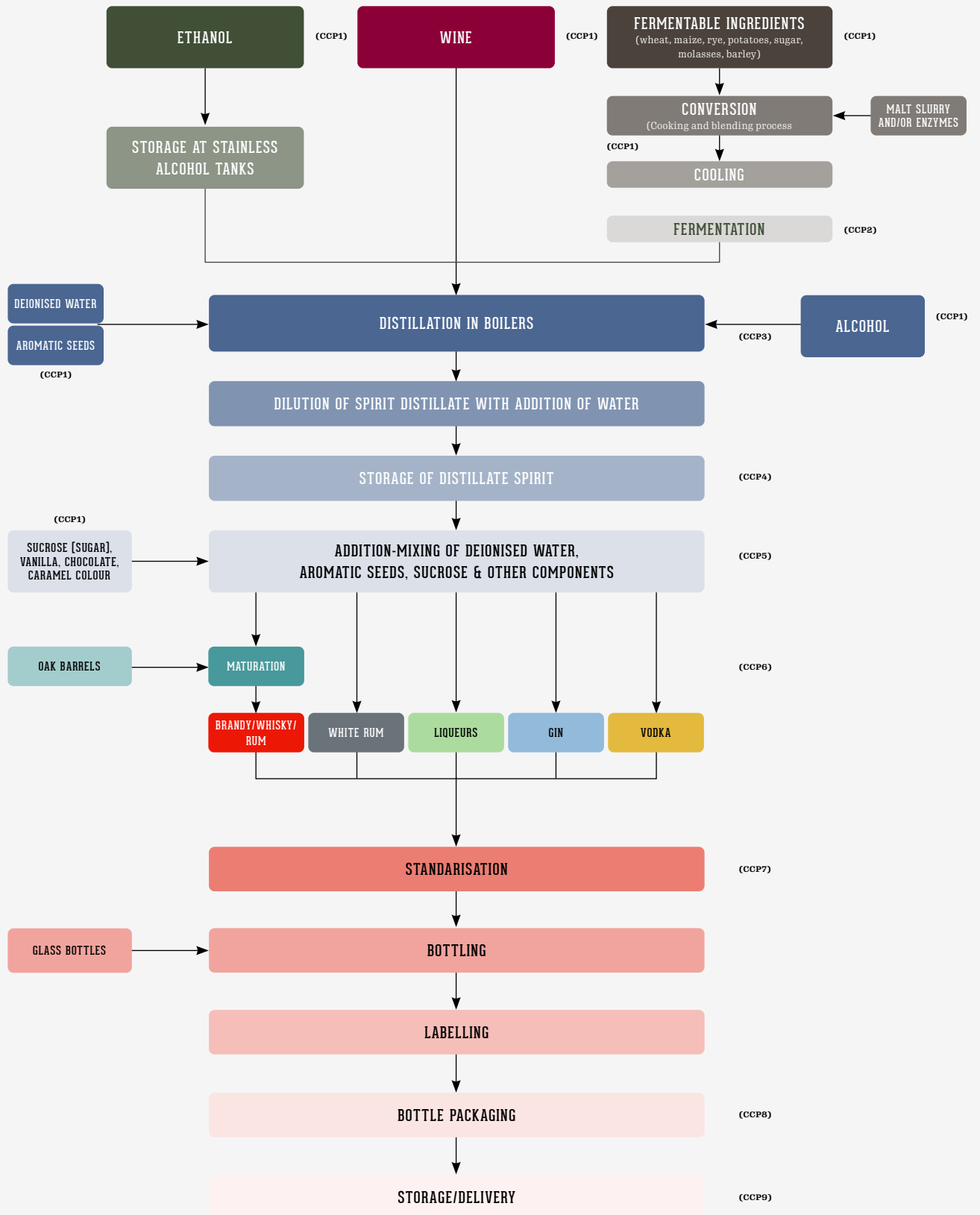


Table 2 - 1 Spirits Production Process Flow Diagram

(Source : Implementation of Hazard Analysis Critical Control Point HACCP) System to The Alcoholic Beverages Industry, Food Reviews International, 17(10), 1-44 (2001), L.K. Kourtis and I,S, Arvanitoyannis*, University of Thessaly, School of Technological Sciences)

2.1. RECEIPT OF RAW MATERIALS

For manufacturers undertaking fermentation, fermentable materials such as grains, sugar, fruit or starch-based material are required. For manufacturers not undertaking fermentation neutral alcohol or wine is required and in both cases flavour additives make the specific taste.

Containers for the final product (typically glass bottles) are bought in as well as other packaging. All the suppliers of raw materials and packaging need to be assessed for their suitability for making a food grade product and specification kept and their quality monitored. Storage locations also need to be considered to prevent contamination of the product through the various production steps that follow. The bottles or cans used to contain the final product should be reviewed against international food contact regulations such as those of EU and AUNZ by the packaging supplier to provide an assurance they are safe for use for containing food.

The person receiving the inwards goods visually checks them for any signs that they may not meet the required standard. Inwards goods should be delivered to their storage points as soon as possible.

2.2. GRAIN HANDLING AND PREPARATION

Distilleries utilise premium fermentable materials such as cereal grains (corn, rye, barley, and wheat), fruit, potatoes, sugar etc to produce the various types of distilled spirits. If grain is used it is received at a distillery from a grain handling facility and is prepared for fermentation by milling or by malting (soaking the grains to induce germination and then roasting). Many distillers will purchase malted grain instead of performing the malting process onsite.

2.3. STARCH CONVERSION TO SUGARS INCLUDING GRAIN MASHING

For alcohol manufacture from grain, mashing consists of cooking the grain to solubilize the starch from the kernels and to convert the soluble starch to simple sugars with barley malt and/or enzymes. Small quantities of malted barley are sometimes added prior to grain cooking. The mash is then passed through a noncontact cooler to cool the converted mash prior to it entering the fermenter.

2.4. FERMENTATION

The converted mash enters the fermenter and is inoculated with yeast. The fermentation process uses yeast to convert the grain sugars into ethanol and carbon dioxide. Congeners are flavour compounds which are produced during fermentation as well as during the barrel aging process.

2.5. DISTILLATION

The distillation process separates and concentrates the alcohol due to the difference in vapour pressure of the alcohol compared to water at a specific temperature. Either the fermented grain mash or neutral alcohol that has been mixed with flavour materials such as spices and berries are the base for distillation. Following distillation, the distilled alcohol spirits are pumped to stainless steel tanks and diluted with demineralised water to the desired alcohol concentration prior to either aging or bottling.

2.6. GRAIN AND LIQUID STILLAGE (“DRYER HOUSE OPERATIONS”)

In most distilleries the grain will be separated from the liquid before distillation. The grains may be sold, land applied (with permitting), sold as liquid feed, or processed and dried to produce distillers dried grains (DDG) and other secondary products.

2.7. WAREHOUSING / AGING

Some spirits are aged in oak barrels. Variations in the aging process are integral to producing the characteristic taste of a particular brand of distilled spirit.

2.8. BLENDING/BOTTLING

Once the spirits have completed their desired aging period (or fresh distilled alcohol in the case of white spirits), they are transferred from the barrels or the still into tanks and reduced in proof (alcohol concentration) to the desired final alcohol concentration by adding demineralised water.

Following a filtration process that renders it free of any solids, the spirit is bottled, and readied for shipment to the distributors.

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