Ministry for Primary Industries
Manatū Ahu Matua

Guidance Document

Chemistry and Manufacturing Information for Agricultural Chemicals

Application information for registration under the Agricultural Compounds and Veterinary Medicines Act 1997

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Te Kāwanatanga o Aotearoa
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Title

Guidance Document: Chemistry and Manufacturing Information for Agricultural Chemicals

About this document

This document explains the chemistry and manufacturing information that should accompany an application to register or vary a registration of an agricultural chemical trade name product under the Agricultural Compounds and Veterinary Medicines (ACVM) Act 1997.

Related Requirements

Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM Act, the Act)

Agricultural Compounds and Veterinary Medicines (Exemptions and Prohibited Substances) Regulations 2011 (ACVM (E&PS) Regulations)

Document history

Version Date	Sections changed	Change(s) Description
2010		
2024	All 1, 2 3 4 5 5.1.1 5.1.2 5.1.3 5.1.4 5.1.5 5.1.8 5.1.9 5.1.10 5.2.2 5.2.3 5.2.4 5.2.5 5.2.7, 5.2.8 5.2.9 5.2.10 5.3.3 5.4.1 5.4.2 5.4.5 5.4.6 5.5	Changed from Information Requirements to Guidance, reformatted Specific sections for Purpose and Background Addition of definitions New section for General Information New section heading for registration of a new product Coppers removed from active ingredients exempt from the requirements to identify a manufacturer Expansion of identification of active ingredient Expansion of physical/chemical properties Expansion of active ingredient specifications Impurity level changed to 0.1%, additional information needed for impurities Expansion of batch analysis, age and number of batches added Expansion of information needed for analytical method Addition of validation data Clarification of formulation composition Addition of physical/chemical properties of the product Addition of synergists and safeners Clarification of excipient data requirements Change from release and expiry specifications to product and QC specifications Expansion of packaging specifications Expansion of batch analysis, age and number of batches added Expansion of manufacturing process Expansion of stability study Additional information on selecting stability conditions, additional active ingredients/products requiring real time stability Addition of cold-stability testing Addition of toxicologically significant impurities and degradation product stability Additional information given on analytical methods

Version Date	Sections changed	Change(s) Description
	5.5.1 6 Annex 1 Annex 2 Annex 3, 4	Addition of validation data New section on variation applications Renamed as Appendix 1, updated Removed Removed, content added into text

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Contents

1 Purpose

This document explains the minimum information needed for MPI to consider the chemistry and manufacturing component of an application to register an agricultural chemical under the Agricultural Compounds and Veterinary Medicines (ACVM) Act 1997.

2 Background

Before being imported, manufactured, sold or used in New Zealand, agricultural chemicals must be authorised under the ACVM Act. Authorisation is required:

- to manage risks to trade in primary produce, public health, animal welfare, and agricultural security
- to make sure that the use of agricultural compounds does not result in breaches of domestic food residue standards, and
- to ensure the provision of sufficient consumer information.

This document should be read in conjunction with Registration Information Requirements for Agricultural Chemicals and Guidance Document: Agricultural Registration.

If the authorisation required for your agricultural chemical product is registration, the following is guidance to the minimum information that should accompany an application for a new product. For a variation to an existing registered product, less information may be required than for a new product.

3 Definitions

(1) In this document, unless the context otherwise requires:

acceptance criteria means the defined acceptable limits or ranges for parameters in a set of specifications

active ingredient refer to the ACVM (E&PS) Regulations

active ingredient manufacturer means any site of manufacture that produces one or more of the active ingredients intended for use in the manufacture of the trade name product (TNP)

active ingredient specifications means the set of test parameters and acceptance criteria established by the manufacturer for the active ingredient.

agricultural chemical refer to the ACVM (E&PS) Regulations

agricultural compound refer to the ACVM Act

batch means a defined quantity of an active ingredient, formulated trade name product, or other material that is intended to have uniform character and quality within specified limits, and is produced according to a specified manufacturing process during the same cycle of manufacture

batch analysis means a document containing the results of tests or assays confirming compliance with the applicable specifications

CAS number means the Chemical Abstracts Service (CAS) number that serves as a specific and unique identifier for a particular chemical compound

chemistry means the chemical identity, properties, specifications, methods of analysis, purity, identity of impurities, and all other physicochemical parameters of an ingredient, combination of ingredients, or formulation

degradation product means an impurity resulting from a chemical change in the substance brought about during manufacture and/or storage of the product by the effect of, for example, light, temperature, pH, water, or by reaction with an excipient

excipient means a substance intentionally added to a formulation that is not an active ingredient. Also known as co-formulants, formulants, inert or non-active ingredients

expiry date means the date placed on the container label of the trade name product designating the time prior to which a batch of product is expected to remain within the approved shelf life, if stored under defined conditions, after which it should not be sold or used

formulated product means the final packaged trade name product available for sale at any time after market release from the manufacturing process

formulated product manufacturer means an entity that undertakes any step of the manufacturing process. This also includes manufacturers of intermediate or incomplete formulated products used in the production of the final trade name product, quality control testing, repacker (packing from bulk/decanting/downpacking), labeller (labelling/relabelling), and release for market entities

formulation composition means the list of all the ingredients and concentrations that, added together, comprise the final formulated trade name product. It describes the qualitative and quantitative formulation of the product. The formulation contains one or more active ingredient(s), and may contain excipients

impurity (active ingredient) means any component other than the pure active (including components originating from the manufacturing process or from degradation during storage)

impurity (formulated product) means any component of a formulation that is not the active ingredient or a chemical entity defined in the formulation. Impurities include reaction products, degradation products, contaminants or chemicals added for purposes of extraction or purification

laboratory scale batch means a very small batch of active ingredient or formulated product (smaller than pilot scale) produced at the research and development stage used to support formulation and package development

manufacture refer to ACVM Act

manufacturing concentrate A material resulting from a manufacturing process comprising the active ingredient, together with associated impurities and excipients. Note: A manufacturing concentrate may be an active ingredient which has not been isolated from the materials, solvents, etc., used to produce it, or it may be a minimally diluted active ingredient intended for use in preparing formulations. Also known as technical concentrate or 'TK'

manufacturing flowchart means the graphical representation that describes the manufacturing process from dispensing of ingredients to labelling, including quality control points

overage means the excess of active ingredient deliberately added to a formulation to compensate for manufacturing loss or loss during storage

packing means all operations, including filling, sealing/closure and labelling, which a bulk product has to undergo in order to become a formulated product

packaging material means any material, including printed material, employed in the packaging of a trade name product, excluding any outer packaging used for transportation or shipment

a) **primary packaging** means those packaging materials that are in direct contact with the product (e.g., bags, blisters, bottles, vials, drums, packs etc.)
b) **secondary packaging** means those packaging materials that enclose the primary packaging materials (e.g., cartons, bags, etc). It may be intended to protect not only the product, but also the primary packaging
c) **recycled packaging** means new packaging that has been produced from recycled materials
d) **reused packaging** means used packaging that has been cleaned and inspected as being fit for purpose

pilot scale batch means a batch of active ingredient or formulated product with the same composition and manufactured by a procedure fully representative of and simulating that to be applied to full production scale. This includes equipment, manufacturing site, manufacturing procedures, in-process controls and post-production testing

product specifications means the set of test parameters and acceptance criteria that determine the suitability of the trade name product throughout its shelf life, and prior to its use when stored in line with the manufacturer's recommendations

> *Note: these are not the same as the 'product and manufacturing specifications' referred to in some conditions of registration (e.g., conditions 60, 61, 63, & 66). The 'product and manufacturing specifications' consist of the sections of the product data sheet identified as being included plus the wider information captured in the chemistry and manufacture data volume.*

proprietary excipient means a non-active ingredient where the composition is confidential to the manufacturer of the ingredient (and not known by the applicant/registrant)

production scale batch means a batch of product that will be produced using equipment, controls, and processes at the manufacturing site(s) proposed in the application, at a volume reflecting the routine manufacturing of the trade name product for the commercial market

QC specifications means the set of test parameters and acceptance criteria used to determine acceptability of each batch (or a representative sample for a continuous process) of product after manufacture is complete, prior to release of the product into the marketplace. These are intended to ensure that the product is being consistently manufactured, to be representative of the product specifications and be suitable for detection of manufacturing issues

> *Note: these are not the same as the 'product and manufacturing specifications' referred to in some conditions of registration (e.g., conditions 60, 61, 63, & 66). The 'product and manufacturing specifications' consist of the sections of the product data sheet identified as being included plus the wider information captured in the chemistry and manufacture data volume.*

real time stability testing means testing under the storage conditions intended for storage throughout the proposed shelf life

release to market means a confirmatory step performed to ensure the TNP complies with the MPI approved registration specifications and conditions after manufacture or importation (and repacking if applicable), and before entering the distribution chain for sale in the New Zealand market. This includes but is not limited to confirming batch and related records have followed the approved process, and that all starting materials, intermediate and formulated product (including packaging and labels) comply with the approved specifications. For products entering New Zealand, release to market also includes a verification check that the imported batch(es) comply and have not been impacted during transit

self-assessable change means a change MPI allows a registrant to make to a registered TNP without prior MPI assessment or approval

shelf life means the time interval from date of manufacture that a product is expected to remain within the approved product specification, provided that it is stored under the conditions defined on the label in the proposed containers and closure

(2) Any words or expressions used but not defined in this document that are defined in the ACVM Act and its Regulations have the meaning given to them in the Act and its Regulations.

4 General Information

(1) This guidance applies to all new product registrations (excluding B1 registrations) and all chemistry and manufacturing changes to existing registrations. The guidance covers:

a) Active Ingredient
b) Formulated Product
c) Manufacturing
d) Stability
e) Analytical Methods

(2) Provide all documentation in English.

(3) Provide justification if you do not include information outlined.

Additional Guidance

- Deviations may be granted allowing alternative data to be provided or waiving a general expectation relative to a particular data set.
- Applicants can make deviation applications to MPI for approval prior to submitting an application, refer to **Guidance Document: Agricultural Chemical Registration**.

4.1 Minimum Information

The minimum information MPI considers necessary is numbered in each section, while any further guidance is given (without numbers, within a border) under '**Additional Guidance**'. The guidance reflects principles commonly recognised by the scientific community as appropriate and necessary for collecting scientific data. MPI recognises that there are acceptable methods, other than those described in this guidance, that are capable of achieving the principles of this document.

(1) Applicants are responsible for providing all information required by MPI to make a decision on the application. Applications should contain the relevant chemistry and manufacturing information as outlined in the guidance.

(2) Applicants may deviate from this guidance but should identify and justify any such deviations with sound technical argument and supporting information.

(3) Applications that do not contain the relevant information or a deviation will not be assessed.

(4) If further advice is required, you are advised to contract the services of an appropriate consultant prior to submitting your application.

4.2 Units

All units should preferably be The International System of Units (SI).

4.3 Data Volumes

When compiling a data volume for submission to support the registration of a new product, the applicant should consider the current state of agricultural chemical development and knowledge and include the most up to date methods and information available as applicable to the product and formulation type.

The data volume should include all chemistry and manufacturing information covered in this guidance for the evaluation of the trade name product. All relevant data and information should be provided regardless of whether the information is favourable or unfavourable. This means that any available information that may impact the risk assessment of the product should be included.

The applicant should also give consideration to any unique hazards or risks that may be posed by their product that are not addressed by the standard guidance and provide suitable information to address these aspects.

In addition to addressing ACVM related risks directly, the chemistry and manufacturing volume is intended to establish the quality and consistency of the product as the basis for consideration of other data volumes (e.g., where a product is more variable than would normally be expected, this will also need to be considered relative to efficacy and residues).

If this formulated product is currently, or has previously been, registered by an overseas authority, provide all information on any past product defects or manufacturing issues relevant to the NZ registration and risk areas from an ACVM perspective.

Each section of the data volume should be sequentially paginated throughout, legible, and logically organised as described in the **E-Files for ACVM Applications** guideline.

5 Registration of a new trade name product

This section sets out the chemistry and manufacturing data that should be submitted in support of an application to register a new agricultural chemical product. For additional guidance on products containing microbial active ingredients, refer to **Guidance Document: Microbial Agricultural Chemicals.**

5.1 Active Ingredient

5.1.1 Manufacturer

(1) Provide sufficient information from each manufacturing site to identify:

a) the name of the organisation
b) the physical address of the manufacturing site
c) the postal address (if different from the manufacturing site)

Additional Guidance

- An intermediate supplier who is used to procure or test the active ingredient prior to inclusion in the formulated product is not the manufacturer of the active ingredient and should not be identified as the active ingredient manufacturer.

(2) For technical concentrate manufacturers include information as per point 1 above.

(3) The following active ingredients are exempt from the requirements to identify a manufacturer if evidence of an appropriate quality system is provided.

a) calcium carbonate
b) sulphur
c) food quality ingredients. These food quality ingredients should comply with a recognised standard such as the Food Standards Code (FSANZ). If these additives comply with a recognised standard, reference the standard.

Evidence that the active ingredient is manufactured consistently and to an appropriate quality (quality system) needs to be provided for these active ingredients if the manufacturer is not identified. A quality system should provide assurance that the active ingredient will meet ACVM approved specifications prior to its inclusion in the formulated product. If the exemption applies, then the applicant should demonstrate to the satisfaction of the ACVM team that they are managing the risk for the active ingredient.

An internal record of the active ingredient manufacturers used and documentation demonstrating that the quality system is being complied with should be available and supplied to ACVM if requested within 5 days for inspection.

5.1.2 Identification and chemical structure

(1) Provide the following information:

a) the chemical (IUPAC, ISO) or common name
b) the chemical abstracts service (CAS) registry number (if assigned)
c) the manufacturer's code number(s) and/or synonyms (if appropriate)
d) empirical molecular formula and molecular weight
e) for active ingredients that are salts or hydrates, also provide the molecular mass of the free base/acid or anhydrous form
f) for polymeric compounds, provide weight average (M_w), number average, molecular weight (M_n) and molecular weight distribution
g) two-dimensional chemical structure.

(2) If applicable, the chemical structure should include stereochemical properties of the active ingredient. For example: geometric isomerism (*cis/trans*, *E/Z*), the number of chiral centres and the configuration of each centre. The chemical structure should be given diagrammatically with all possible or known stereochemistry.

Additional Guidance – plant extracts

- For these types of active ingredients where composition varies – the lead component(s), or "chemical fingerprint" is to be discussed. Identification and characterisation are required. Due to the variation in composition of these active ingredients, the data needs to be sufficient to provide assurance that the composition is sufficiently understood and will be sufficiently consistent for it to be 'fit for purpose'. See OECD guidance for more information: Guidance Document on Botanical Active Substances Used in Plant Protection Products.
- For some active ingredients there may be an international standard – e.g.., ISO standard ISO 4730 for tea tree oil

5.1.3 Physical and chemical properties

(1) All relevant chemical and physical properties of the active ingredient should be provided. The information should include, as appropriate:

a) a general description, for example, appearance, colour, physical state*
b) if the active ingredient is optically active, a specific optical rotation measurement with limits*
c) if an active ingredient contains geometric isomers (cis/trans, E/Z), a specification of whether the active ingredient is a pure geometric isomer, or a fixed combination of geometric isomers*
d) Other parameters as applicable to the product and its risk profile – i.e., solubility in water/organic solvents*
e) if an active ingredient contains one or more chiral centres, a specification of whether the active ingredient is a pure enantiomer, racemate or fixed combination of non-enantiomeric isomers
f) the melting point or range (for solids)
g) the boiling point or range (for liquids)
h) if the melting and/or boiling point cannot be determined because of decomposition or sublimation, the temperature at which decomposition or sublimation occurs
i) the condensation point (for gases)
j) the refractive index (for liquids)
k) the density or specific gravity (for liquids)
l) the UV absorption maxima and molar absorptivity
m) the pH and pKa values
n) the vapour pressure
o) Henry's Law Constant
p) the solubility in water expressed as g/L or mg/L, in the neutral range, acidic range (pH 4 to 6) and in the alkaline range (pH 8 to 10)
q) the solubility in various organic solvents expressed as g/L or mg/L
r) the n-octanol/water partition coefficient (K_{ow})
s) the hydrolysis in aqueous solution under acid, neutral and basic conditions
t) the dissociation characteristics including dissociation constant, if appropriate
u) the flash point (where the melting point is below 40˚C)
v) the flammability including auto-flammability
w) explosive properties
x) photochemical properties
y) oxidising properties
z) the auto-ignition temperature
aa) corrosion characteristics

* Where an active ingredient can be cross referenced to data previously provided in support of a registered TNP, the * denotes the minimum information required.

(2) The purity of the test substance used to generate the physical and chemical properties should be stated.

(3) You should also state the methods used to generate the data provided. Where the method is in a scientifically recognised publication or manual—for example, those by the Organization for Economic Cooperation and Development (OECD), the Collaborative International Pesticide Analytical Council (CIPAC), or the American Society for Testing Materials (ASTM)—a reference to the publication used will suffice. If not a recognised method, then additional information will be required to support the method used.

(4) It is desirable that physical properties such as solubility in water and vapour pressure be determined from tests conducted at ambient temperature (20–25˚C). However, if data are available at another temperature, these may be provided. The temperature at which these tests were conducted, or other relevant test conditions, should be stated.

5.1.4 Specifications for active ingredients

(1) Provide sufficient information to identify the manufacturer's specifications for the active ingredient – including minimum active purity, isomeric ranges or ratio (where applicable) and maximum impurity content derived from analysis of representative commercial batches. State which specifications are to be tested for every batch.

Additional Guidance

- It is the registrant's responsibility to ensure these specifications are always complied with, however this may be achieved through means other than testing all specifications for every batch.
- Where specifications are proposed in the form of a numerical range, the range should be set such that the test results will fall within the range without rounding. If a result is below the lower limit or above the upper limit, regardless of rounding, it is considered out of specification.

(2) Where the same active ingredient is produced at different sites by the same company and manufacturing process, the profile should encompass all sites. Where the manufacturing process differs between sites, or the manufacturers differ, the purity/impurity profiles should be defined separately.

(3) MPI harmonises with the following agencies for specifications for an active ingredient (in this order): NZ EPA, APVMA, FAO. State whose specifications have been referenced.

Additional Guidance

- Where FAO has an updated specification that NZ EPA or APVMA may not have considered in their specification, this should be taken into consideration.

(4) Any deviation from conforming to the NZ EPA, APVMA or FAO specifications will need to be supported by technical argument. If there are no specifications from any agencies above, information or an argument needs to be supplied for the specifications chosen.

(5) EPA may apply specifications for the active ingredient under S77A of the HSNO Act, these are required to be part of the active ingredient specifications.

5.1.5 Active ingredient impurities

(1) You should identify and report on impurities under the following conditions:

a) Any impurities present at greater than or equal to 1 g/kg (0.1%)
b) Toxicologically significant impurities which are present at any level should be identified, characterised, and quantified

(2) Provide the following information on impurities to identify:

a) name
b) structural formula
c) CAS number (if available)
d) quantity (SI units)
e) maximum allowable limit

(3) Potential sources of impurities include:

a) impurities in the starting materials
b) residual solvents, reagents or immediate precursors
c) trace elements arising from the use of catalysts or other sources
d) the degradation of the active ingredient that may occur after manufacture
e) the amount of water or moisture present
f) the amount of solvent left after final purification

(4) The likelihood of compounds such as dioxins, dibenzofurans, hexachlorobenzene and nitrosamines being present should be considered if relevant to the molecular structure, manufacturing, or degradation process of the active ingredient.

(5) Picloram – MPI has its own minimum requirements which supersede all other agencies – the hexachlorobenzene impurity should be less than 50 mg/kg (50 ppm or 0.05 g/kg or 0.005%). This standard is based on local New Zealand data for forage feed uses.

(6) If there is potential for the formation of toxicologically significant impurities or by-products this should be declared and quantified. You should also provide details of the conditions leading to their formation and the steps taken to control the formation of toxicologically significant impurities.

Additional Guidance

- A general list of toxicologically significant impurities for active ingredients is available on the APVMA 'standards for active ingredients' page General list of impurities and classes of impurities of toxicological concern for agricultural active constituents | Australian Pesticides and Veterinary Medicines Authority (apvma.gov.au). Note this list may not necessarily be exhaustive.
- For novel active ingredients where there are no APVMA or FAO specifications, refer to JMPS Manual (Manual on the development and use of FAO and WHO specifications for chemical pesticides) for determination of relevance and establishing specifications limits of impurities for additional information.
- The sum of the quantitative level of the active ingredient and impurities (and in some cases additives/stabilisers) is often referred to as the mass balance. Mass balance is an important parameter to consider to ensure all major impurities have been detected. The mass balance need not add up to exactly 100 per cent, however, it is expected to be in the range of 98–102%.

5.1.6 Additives

(1) Identify the purpose and specifications of additives such as stabilisers and emetics.

5.1.7 Manufacturing concentrate

(1) If a manufacturing concentrate is used, provide the following information:

a) information on the active ingredient as per 5.1.4 - 5.1.5
b) formulation composition of the manufacturing concentrate including:

i) final concentration (nominal and range) of active ingredient present in the manufacturing concentrate after adjustment for purity, diluents and/or additives used
ii) identification of diluents and/or additives uses, and their concentrations
iii) any impurities generated/formed during the manufacture of the concentrate.

5.1.8 Supporting information (batch analyses)

(1) Supporting information is required for each proposed active ingredient manufacturing site. Provide at least three production scale batch analyses from each site. At least one of these batches must be produced in the last 5 years (at time of submission).

(2) Each batch analysis should include:

a) active ingredient clearly identified
b) date of manufacture
c) date of analysis
d) batch number/identification
e) batch size
f) site of manufacture (company name and physical address)
g) results for all appropriate parameters such as active content and impurities, using appropriate determinative analytical methods (including counter ions when present), along with specifications/limits. Actual numerical results should be provided rather than vague statements such as 'within limits' or 'conforms'
h) identification of the analytical method(s) used (see 5.1.9)

(3) Supporting information should also include:

a) details of the test method(s) used for active content and impurities (see 5.1.9)
b) validation of active content and impurities methods, if not CIPAC published methods (see 5.1.10)

(4) For active ingredients which do not have production scale data, a technical justification should be provided as to why a pilot or laboratory scale batch can be considered to be representative of a production scale batch and expected impurities. Production scale batch(es) may still be required to be provided as a condition of registration.

Additional Guidance

- The justification should include a discussion of differences (if any) in the manufacturing processes of pilot/laboratory and production scale, including mixing times, production conditions (e.g., temperatures), and equipment used. Providing only a statement that pilot/laboratory batches are an acceptable representation of production scale will not be accepted.
- As ACVM is unable to verify APVMA information, reference to active ingredient manufacturing sites via an APVMA approval number and consequently provision of the approval notice (in lieu of data) is no longer available.

5.1.9 Analytical methods

(1) You should provide full details of the test method(s) used for determining the active ingredient concentration, all impurities at 1g/kg (0.1%) or greater and any toxicologically significant impurities in the active ingredient. All other analytical methods used for testing the active ingredient should be described. If the method is a CIPAC method, it does not need to be provided/described.

(2) Refer to section 5.5 for further information.

5.1.10 Validation data

(1) You should provide validation data for the method(s) used to assay the active ingredient(s) and toxicologically significant impurities. If the method is a CIPAC method, only selectivity and accuracy data are required.

(2) Refer to section 5.5.1 for further information.

5.2 Formulated Product

5.2.1 Formulation type

(1) State the formulation type. Refer to Appendix 1 for a description of formulation types. If the formulation type is not listed in Appendix 1 or in the current FAO manual, use the one that bears the closest resemblance to the formulation type required and justify this selection (see CropLife International, Catalogue of pesticide formulation types and international coding system, Technical Monograph No: 2 for coding of unusual formulations to assist with determining closest resemblance).

5.2.2 Formulation composition

(1) The declared formulation composition should be a complete and accurate list of the ingredients that are added during the manufacturing process, their concentrations, and their functions.

(2) Data presented should include:

a) the common or chemical names of the active ingredient(s) and excipients. See 5.2.5 for data requirements to support formulation composition.
b) the Chemical Abstracts Service (CAS) Registry Number (where available).
c) the concentration of all active ingredient and excipients in the formulation composition.
d) the function of each ingredient in the formulation composition (for example, whether it is the active ingredient, a surfactant, an emulsifier, a filler).

(3) If in the manufacturing process the amount of active ingredient(s) is adjusted based on the actual purity, this should be stated in the formulation table.
For example, if the label claim concentration of an active ingredient in a batch of product is 275 g/kg, and the minimum or nominal purity of the active ingredient being used is 95%, (950g/kg), then the amount of the active ingredient to be stated would be:

275 g/kg÷ (950/1000) = 289.5 g/kg

(4) State a nominal quantity for each ingredient. For excipients, variations within the following limits are considered acceptable without being stated, on the provision that they do not alter the properties or risk profile:

Nominal concentration of excipient (N) (g/kg or g/L)	% Allowable variation relative to N
N ≤ 10	± 10%
10 < N ≤ 200	± 5%
200 < N ≤ 1000	± 3%

(5) If a wider range applies during production, state the nominal (discrete) content and the range, specifying how the range was determined. The choice of the range with respect to the risk profile of the product should be discussed to explain why it is acceptable.

(6) A *quantum satis* (q.s.) designation may be used in association with one ingredient quantity if that ingredient is added to an endpoint rather than a set nominal content. In this situation state the expected nominal value and in brackets ‘q.s.’ and justify why this this is not a fixed amount (e.g., adjustment for active ingredient purity).

(7) For excipient ingredients used as pH adjusters – state the typical value in addition to stating ‘to pH’.

(8) For formulations where the active ingredient/excipients change during manufacturing, a pre-reaction and post-reaction formulation should be supplied in a separate formulation table. e.g.:

a) formation of an active salt, (e.g., the active ingredient is barium selenite but separate barium and selenium compounds are added)
b) an ingredient is otherwise altered in some way (e.g., water loss during heating or drying),

c) some formulations with an encapsulated active ingredient.

Additional Guidance

- If the product contains separate formulations such as coatings, show these as separate distinguishable formulations.

(9) Ingredients that are mixed together as a completely separate process and stored prior to manufacture of the end-use product should be uniquely identified. The formulation of these should be provided.

(10) For premixes (that are made as part of the same manufacturing process), individual components of a premix should be listed separately in the formulation table. Preparation of the premix should be clear in the manufacturing process.

(11) If an overage (small excess) of an active ingredient has been deliberately added, the actual concentration (nominal plus overage) should also be stated. Provide an explanation of why the overage is required e.g., to cover losses during manufacture, storage, or both. Address any impacts on efficacy, safety, or residues.

(12) All ingredients should be expressed in g/L for liquid formulations and g/kg for solid formulations. If these units are not appropriate for a particular formulation, the applicant should propose suitable units (for example, a biological unit).

Table 1: Example of a Trade Name Product formulation table

Ingredient Name (Common or Chemical)	**CAS Number**	**Quantity (g/L)**	**Function**
Active Ingredient 1 (nominal 97% purity to give 50 g/L)	111-22-333	54.0[1]	Active Ingredient
Active Ingredient 2 (minimum 95% purity to give 275 g/L)	44-555-66	289.5	Active Ingredient
Safener A	777-888-99	50	Safener (Critical excipient)[2]
Propylene Glycol	57-55-6	15	Antifreeze
Mixture[3] of: 1,2 Benzisothiazol-3(2H)-one 20% Propane-1,2-diol 60% Sodium hydroxide 6% Water 14%	 2634-33-5 57-55-6 1310-73-2 7732-18-5	1	Preservative
Wetting agent A or Wetting agent B	123-45-667 123-78-687	2	Wetter
Surfactant A (Proprietary excipient) or Surfactant B (Proprietary excipient)	Mixture[3] Mixture[3]	20	Surfactant
FD&C Blue No. 1	3844-45-9	0.05	Colourant
HCl (10% solution in water)	7647-01-0 7732-18-5	0.1 (to pH)	pH adjuster
Water	7732-18-5	618.35 (q.s.)	Carrier
Specific gravity	1.050		
Other information about formulation (for example, overage, isomers)			

[1]Includes a 5% overage (2.5g/L) to manage loss on storage in addition to nominal purity adjustment of 97%. Calculation (50 ÷ 97%) + 2.5 = 51.5 + 2.5 (54.0)

[1] Overage – see 5.2.2 (11)

[2] Synergists and Safeners – see 5.2.4

[3] Mixtures - see 5.2.5

5.2.3 Physical and chemical properties of the product

(1) The following data on the physical and chemical properties of the product should be provided:

a) appearance, colour, physical state
b) acidity, alkalinity, or pH value
c) bulk density (solids)
d) density or specific gravity (liquids)
e) viscosity and surface tension (liquids)
f) relevant characteristics applicable to the formulation type (for example for wettable powder: suspensibility, wet sieve test, wettability, and persistent foam)
g) oxidising properties
h) corrosive hazard

5.2.4 Synergists and safeners (as critical excipients)

(1) Identify synergists and safeners intentionally added to a formulation to manage or enhance characteristics of the formulation itself, and which significantly alter the risk profile from an ACVM perspective of a product.

(2) Note both their function (e.g., Safener) and their status as a critical excipient in the formulation table.

Additional Guidance

- More information may be required to support the function of the excipient.
- Other critical excipients may be identified. These have effects that are beyond the normal impacts of co-formulants and can have a dramatic impact on factors such as the efficacy, plant safety or residue/trade of the product.

5.2.5 Excipient data requirements

Identification of single component excipients

(1) Provide the following information:

a) the chemical (IUPAC, ISO) or common name
b) CAS registry number (where available)

(2) If no CAS number has been assigned (or is not applicable), supply full details of the excipient and include:

a) the chemical name
b) chemical description supported by documentation.

Additional Guidance

- Some excipients contain impurities or moisture; however, these are still considered to be single excipients. For example, Xanthan gum contains some water. The water would be considered a contaminant/impurity as water has not been added to the gum, rather it is inherently present but unable to be completely removed from the gum. Xanthan gum is therefore considered to be a single component

excipient. However, if anything is intentionally added to the Xanthan gum (including additional water), this would be an excipient containing more than one component.
- Proprietary names (if applicable) can be listed along with chemical name.

Identification of excipients which contain more than one component, or where the composition is unknown

(1) If the excipient is a mixture, its full formulation information, including chemical names, CAS numbers, and percentage of each component in the mixture should be provided. The individual components of the mixture can be listed in the data volume or supplied separately, and 'mixture' stated in the formulation table instead of a CAS number.

(2) If the composition of an excipient is confidential to the manufacturer and details are not known to the registrant, request that the manufacturer provide formulation information for the proprietary excipient directly to MPI in confidence. Please supply the manufacturer with the trade name and ACVM registration number of the product (if known) to use as a reference. The proprietary name will need to be stated in the formulation table, and "mixture", "proprietary" or "proprietary mixture" used instead of a CAS number.

(3) If the full formulation of a proprietary excipient is stated in the formulation table, the proprietary name is not required. The excipient may then be replaced by an excipient of identical composition without the need for a variation application.

(4) More than one proprietary excipient can be listed where these have been shown to be acceptable alternatives. The full formulations of each proprietary excipient should be supplied, and discussion/data provided to establish equivalence.

Additional Guidance

- If a proprietary excipient is specified in the formulation, it cannot be exchanged for any other excipient without approval by ACVM.

Impurities from the excipients

(1) Identify, quantify, and report any impurities of toxicological/residue concern.

(2) The likelihood of compounds such as dioxins, dibenzofurans, hexachlorobenzene and nitrosamines being present should be considered.

5.2.6 Multiple formulations

(1) An alternative formulation composition can be registered if the proposed differences between formulations do not alter the following properties of the registered trade name product:

a) identity and concentration(s) of the active ingredient(s)
b) formulation type
c) physical and chemical characteristics of the formulated product to the extent that the risk profile under the ACVM Act changes.

(2) Each alternative formulation composition should be uniquely identified (e.g., Formulation A, Formulation B; name of manufacturer; etc). All information must be provided for each formulation (manufacturer(s), manufacturing process, specifications, batch analyses) and clearly identified using the unique formulation identifier. Where these apply to all formulations, this should be clearly stated.

(3) Where the manufacturing process, analytical methods, QC/product specifications are different, these should be provided and clearly marked as to which alternative formulation they are associated with, or it should be clearly stated that the information provided applies to all.

(4) If multiple formulations are approved, it should be clear in submitted documentation which manufacturer produces which formulation(s).

5.2.7 Product specifications for the formulated product

(1) Product specifications should include:

a) active ingredient content
b) chemical and physical characteristics applicable to the formulation type (refer to Appendix 1 or the FAO manual), and any other product-specific specification that is required to ensure the product is fit for purpose over the approved shelf life.
c) Toxicologically significant impurities, impurities formed during manufacture and/or degradation products that may be produced or increase over storage (where applicable), (see 5.2.11)
d) EPA may apply specifications to the formulated product under S77A of the HSNO Act, these are required to be part of the formulated product specifications
e) Synergists, safeners and other critical excipients (where applicable), (see 5.2.4)
f) Contaminants (where applicable to manage the risks from an ACVM perspective)

Additional Guidance

- ACVM does not support specifying the level of a contaminant in a formulated product as part of the product specification where that contaminant would be preventable by conforming to vigilant manufacturing and quality assurance practices. The expectation is that the manufacturer should have robust systems in place to avoid contamination when formulating a product.
  However, should it occur unexpectedly, then the registrant can request whether ACVM would accept a batch specific variation for release.
- Where specifications are proposed in the form of a numerical range, the range should be set such that the test results will fall within the range without rounding. If a result is below the lower limit or above the upper limit, regardless of rounding, it is considered out of specification.

(2) Analytical methods used to test each parameter are required to be stated along with appropriate acceptance criteria. Refer to 5.5 for details.

(3) Where required, the condition(s) of testing should be stated, e.g., for pH, dilution conditions (e.g., 1% aqueous dilution or undiluted (neat)).

(4) Test method validation data is required to be provided for the analytical methods used to assay the active ingredient concentration, and toxicologically significant impurities and degradation products if applicable. Refer to 5.5.1 for details.

(5) The active ingredient content should be at least within the following tolerances:

Declared content (g/kg or g/L at 20°C)	Tolerance*
Up to and including 25	± 15% of the declared content for homogeneous formulations (EC, SC, SL etc) OR ± 25% for heterogeneous formulations (GR, WG, etc)
Above 25 and up to and including 100	± 10% of the declared content
Above 100 and up to and including 250	± 6% of the declared content
Above 250 and up to and including 500	± 5% of the declared content
Above 500	± 25 g/kg or g/L

(6) Justification is required where the proposed specifications for an active ingredient are outside the above tolerances.

(7) For a formulation containing multiple active ingredients, specifications should be provided for each active ingredient.

(8) If the formulation type is not listed in Appendix 1 or in the current FAO manual, use the one that bears the closest resemblance to the formulation type required. In such cases consideration should be given to whether it may be appropriate to add additional parameters.

(9) It is expected all parameters from Appendix 1 for the formulation type are included. If additional specifications are proposed provide a rationale explaining why they are proposed. If parameters are omitted, scientific argument should be provided (e.g., an equivalent parameter could be used in place of an expected parameter with appropriate technical justification).

(10) Refer to FAO manual for general acceptance criteria for each parameter. Where no limits are specified in the FAO manual, justify the proposed limits. Where proposed limits are outside of generally accepted limits additional information or arguments will be required to address this.

Additional Guidance

- Packaging stability is not considered a Product specification (only required as a stability trial parameter), although inclusion of a packaging specification should be considered (e.g., no significant degradation or distortion).

5.2.8 Quality Control specifications for the formulated product

(1) Quality control (QC) specifications should include:

a) active ingredient content
b) chemical and physical characteristics applicable to the formulation type (refer to Appendix 1 or the FAO manual), and any other product-specific specification that is required to ensure the product is fit for purpose.
c) Toxicologically significant impurities, impurities formed during manufacture and/or degradation products that may be produced or increase over storage (where applicable) (see 5.2.11)
d) EPA may apply specifications to the formulated product under S77A of the HSNO Act, these are required to be part of the QC specifications
e) Synergists, safeners and other critical excipients (where applicable), (see 5.2.4)
f) Contaminants (where applicable to manage the risks from an ACVM perspective)

(2) Analytical methods and validation information should be supplied in a similar manner to product specifications, see 5.2.7 (2)-(10)

Additional Guidance

- For some TNPs the QC and Product specifications are the same.
- For some TNPs not all the Product specifications are necessarily appropriate or suitable for QC specifications and therefore not tested on each batch as part of the batch release testing. In other cases, alternative tests may sometimes better facilitate smooth progression of a batch through the plant, e.g., in the case of a suspension concentrate, particle size and viscosity (or other rheological parameters) might be used to represent properties related to suspensibility, spontaneity of dispersion or pourability. Therefore Appendix 1 (or the FAO manual) is only a reference guide for the QC specifications, and a rationale is required to support omitted parameters if scientific argument has not already been provided in product specifications.
- QC specification tolerances should be narrower than Product specifications where required, to remain within the Product specifications throughout the proposed shelf life, particularly where the formulation has a degree of instability. The reason for this is that if the product is released for sale at the limits of the specification, and the QC and Product specifications are the same, there is a likelihood the Product specifications will be breached during the product's shelf life.
- Where specifications are proposed in the form of a numerical range, the range should be set such that the test results will fall within the range without rounding. If a result is below the lower limit or above the upper limit, regardless of rounding, it is considered out of specification.

- Packaging stability is not considered a QC specification (only required as a stability trial parameter), although inclusion of a packaging specification should be considered (e.g., no significant degradation or distortion).

5.2.9 Packaging specifications for the formulated product

(1) Provide sufficient information about the packaging to be approved, including:

a) construction material
b) cap composition/description
c) volume: specify all pack sizes for which approval is sought. If different from the container volume, specify the product fill volume also. A pack size range can be requested.
d) colour (where applicable for light sensitive products)
e) lining/layers i.e., coextruded – each layer should be identified and the layer in contact with the product should be stated.

Additional Guidance

- Where a pack size range is requested (e.g., 1 L – 1000 L HDPE), the pack sizes to be marketed should also be stated (e.g., 1 L, 5 L, 10 L, 500 L HDPE). A pack size range may be approved if it is considered that there is no additional risk associated with pack sizes within the assessed range after consideration of the product, its specifications, and packaging-specific details such as construction materials. Additional pack sizes within the approved range and packaging specifications for that range can be chosen and marketed without applying for a variation.

(2) If the formulated product has inherent chemical characteristics, and the packaging is designed to manage the associated risks, (e.g., high acidity), comments on the packaging should be made. These could cover:

a) porosity
b) permeability
c) impact strength
d) closure type
e) stability (photolytic and hydrolytic stability of biodegradable packaging).

(3) Provide a description of the container closure system, including the composition of the construction materials of each primary packaging component and its specification. Identify and briefly discuss any specialised closure systems, such as tamper-resistant lids and multi-layer closure systems required to manage product-specific risks.

(4) For secondary packaging:

a) Where the secondary packaging **serves to protect or preserve product quality** (and/or the integrity of sensitive primary packaging such as water-soluble bags) provide sufficient information as per section 5.2.9 (1), and discuss the impact the secondary packaging will have on the product properties including the quality and stability profile of the product (e.g., such as photosensitivity, temperature sensitivity, oxygen or moisture sensitivity, and any other relevant parameters). Provide stability data including the secondary packaging if relevant.

(5) New component packaging materials should be used unless otherwise stated.

(6) Use of recycled or reused materials can be considered with sufficient data, information, and documentation of operating procedures to ensure that the risks associated with the use of such packaging are appropriately managed. If the use of recycled or reused packaging is proposed, provide details including the method of recycling/reuse, the physical and chemical characteristics of the trade name product, the process for determining it is fit for purpose and the risk management procedures proposed for the management of such a practice.

5.2.10 Supporting information for the formulated product (batch analysis)

(1) Provide a minimum of one batch analysis to confirm compliance with Product specifications (and any additional test parameters included in QC specifications, that are not included in Product specifications) from a production scale batch no more than 5 years old (at time of submission). For each additional site of manufacture a batch analysis meeting QC specifications may be sufficient.

Additional Guidance

- The date of analysis should be as close as possible to the date of manufacture.
- Batch analysis is required for each formulation composition or variation to the formulation (from each site producing the formulation composition)

(2) Each batch analysis should include:

a) the product name clearly identified
b) date of manufacture
c) date of analysis
d) batch number/identification
e) batch size
f) site of manufacture (company name and physical address)
g) results for all parameters, using the specified methods, along with specifications/limits. – Actual observed/numerical results should be provided rather than vague statements such as 'within limits' or 'conforms'
h) identification of the analytical method(s) used (see 5.1.9)

(3) Supporting information should also include:

a) details of the test method(s) used (see 5.1.9)
b) validation of active content method(s), if not CIPAC published methods (see 5.1.10)

Additional Guidance

- Sufficient information should be provided to ensure that analytical methods stated can be traced back to all documentation provided e.g., unique method identifier consistent across all documentation.

(4) Report all results, including those that do not conform to the specifications.

(5) The time zero analysis from the stability study can be used as the batch analysis, as long as all required parameters are included, and it otherwise meets the expectations outlined above.

(6) Data from laboratory or pilot scale batches may be considered with appropriate technical justification as to why they are representative of production scale manufacture. If batch analyses for production batches have not been supplied, MPI may require additional information post-registration under conditions of registration.

Additional Guidance

- The justification should include a discussion of differences (if any) in the manufacturing processes of pilot/laboratory and full scale, including mixing times, production conditions (e.g., temperatures), and equipment used. Providing only a statement that pilot/laboratory batches are an acceptable representation of production scale will not be accepted

5.2.11 Limits of toxicologically significant impurities in formulated product

(1) Set limits for toxicologically significant impurities in the product where these may increase over storage, migrate from package, or are otherwise not adequately controlled using active ingredient impurity specifications.

(2) For active ingredient impurities, the concentrations found after product storage should be in a proportionally appropriate concentration to meet the nominated limit associated with the active ingredient. (e.g., EPA controls, APVMA standard).

Additional Guidance

- An expiry date is required for products that have active ingredients which are associated with increases of impurities of toxicological concern during storage.

5.3 Manufacturing

5.3.1 Manufacturer of the trade name product

(1) Provide sufficient information from each site of manufacture to detail:

a) the name of the organisation
b) the physical manufacturing site address
c) the postal address
d) step(s) of the manufacturing process conducted

Additional Guidance

- Quality control is considered a step of the manufacturing process. Include all QC testing sites of the formulated product. State which tests are performed at each site if the complete suite of tests is not performed.
- If one manufacturer manages the entire manufacturing process, from raw materials through to the packaged and labelled product including QC testing it is appropriate to state: “all steps”.
- If multiple formulations are approved, it should be indicated which formulations are produced at each site.

5.3.2 Release to market entities

(1) Provide sufficient information from each responsible manufacturer to detail:

a) the name of the organisation
b) the physical address
c) the postal address

Additional Guidance

- The company responsible for ‘release to market’ is the entity who performs a confirmatory step and ensures the formulated agricultural chemical (TNP) is in compliance with ACVM registration (including labels) and releases the product for sale. (Refer to definition for full description). In some cases, there may be more than one such company.

5.3.3 Manufacturing process

(1) Provide a description of all stages involved in the manufacture of the trade name product, in the form of manufacturing instructions or a full description and/or a flowchart with explanations. The description should have sufficient information to detail:

a) the entire manufacturing process, from raw materials through to the packaged and labelled product
b) the sequence of manufacturing steps, including preparation of premixes
c) specific types of equipment (e.g., bead mill, high shear mixer, rather than mill, mixer)
d) the process controls used during production
e) where raw materials enter the manufacturing process

f) critical control points
g) in-process control test points, tests and acceptance criteria
h) final product quality control test point
i) filling, packing, and labelling description including quality checks,
j) if product may be repacked from bulk/decanted/downpacked and/or labelled/relabelled, include as part of the manufacturing process, and
k) description of process for final release of product for sale.

(2) All essential steps and processes should be detailed, such as when the product or ingredients are exposed to heat or processes likely to lead to toxic impurities.

(3) The critical control points should be relevant and controlled by objective measurement.

(4) A description of the process to deal with a product that does not comply to QC specifications should be provided.

(5) Where more than one manufacturing site or manufacturing formulation is registered, the manufacturing process for each should be described. Where the process is the same, this should be clearly stated.

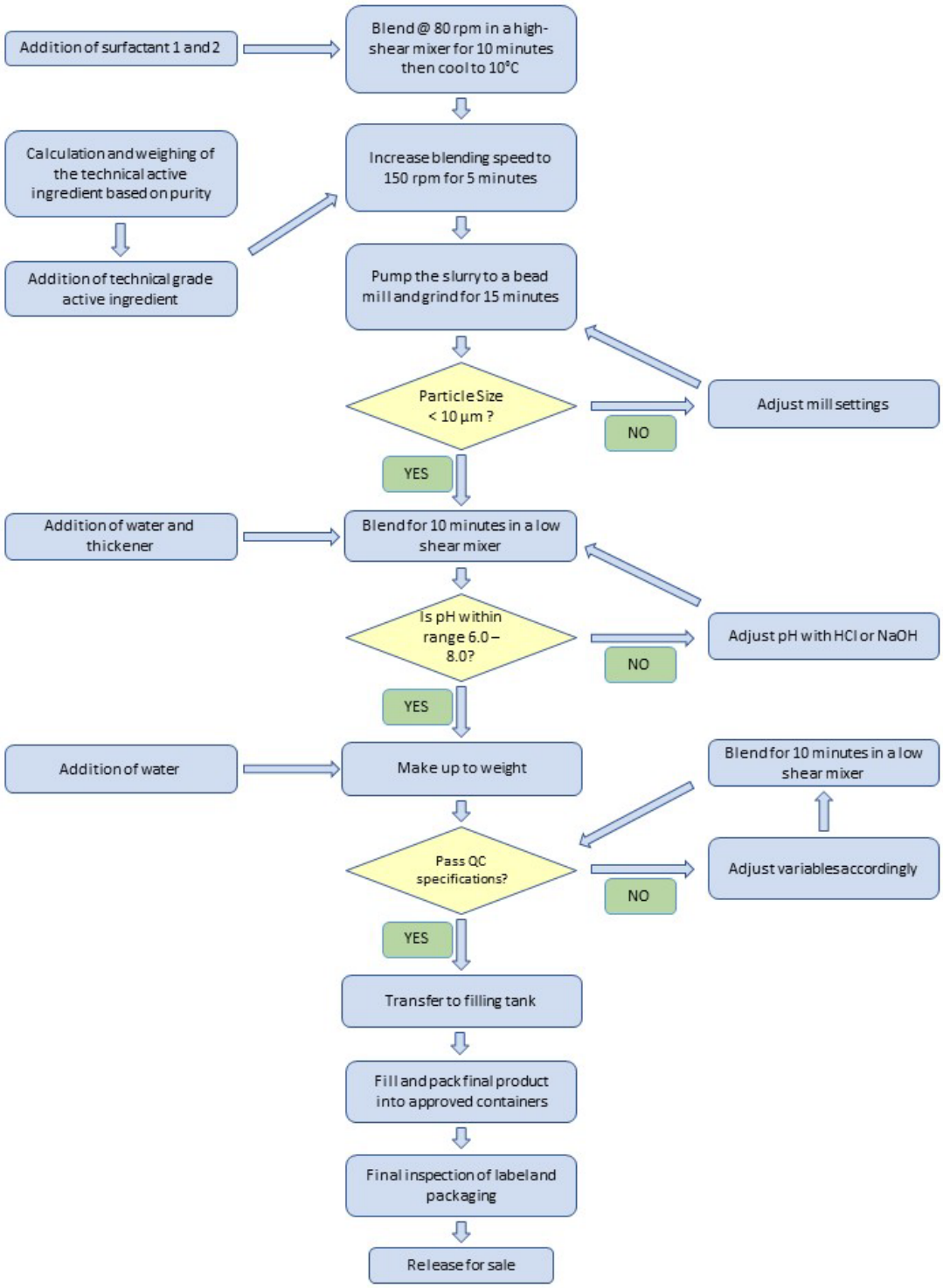
(6) The typical batch size or range should be supplied as part of the original registration or variation information to support the batch analysis data to confirm a production scale batch.

(7) If different manufacturing equipment/processes are used due to different batch sizes, both processes should be included, and the batch sizes indicated.

Additional Guidance

- If repacking/decanting/downpacking occurs, the batch number should be able to be tracked back to the original batch and the date of manufacture should be the same date as the original batch.

Example of Manufacturing Flowchart



5.4 Stability

(1) Nominate a proposed shelf life. The length of time should be supported by stability data.

(2) Provide data to confirm that the formulated product will remain within the product specifications for the proposed shelf life, when stored in its unopened original container, under label storage conditions.

Additional Guidance

- Agricultural chemicals generally supply data to support a shelf-life of 2 years. Data to support a shelf-life that is longer than 2 years is not required to be supplied to ACVM unless the applicant wishes to specifically state a longer shelf-life on the label (refer to the **Guidance Document: Labelling Agricultural Chemicals** for more information on the use of a shelf-life statement/expiry date on the label).

(3) Provide evidence of how characteristics of the product vary with time under the influence of a variety of environmental factors such as temperature, humidity and light if applicable, which enables recommended storage conditions and shelf lives to be established.

(4) State intended storage conditions (including temperature range and other specific conditions).

(5) Identify and quantify any toxic degradation products (see 5.2.11).

(6) Discuss any observed variations from the product specifications and the likely impact of these on the proposed shelf life.

(7) Discuss any unusual results and any significant changes within a given parameter, even if the product is released within the proposed QC specification and remains within the product specification over the duration of the trial.

5.4.1 Stability study

(1) Provide a full stability study report. The report should be presented in a format which includes:

a) how the study was conducted
b) results
c) discussion of results
d) conclusion

(2) Provide sufficient information on the stability study to detail:

a) date of manufacture
b) dates of analysis
c) batch number/identification
d) batch size

(3) Stability studies should be conducted on the same formulation(s) as that proposed for registration in New Zealand.

(4) Stability data should cover all storage conditions proposed on the label.

(5) Stability studies should be conducted on the trade name product in the marketed packaging in the smallest proposed marketed pack size. Smaller packaging of the same construction and material than that proposed to be sold may be used.

Additional Guidance

- Applicants may also wish to market their products in a smaller container at a later date, therefore undertaking the stability study in a smaller container of the same material and construction would demonstrate the product pack is fit for purpose for not only the current marketed product size but for future, smaller pack sizes.

- Where the secondary packaging **serves to protect or preserve product quality**, this should be included in the stability testing.
- If large pack sizes are proposed relative to the size used in the stability studies (e.g., 100 L, where the pack size used in the stability study was 20 L), address the potential for instability in these through data or justification e.g., phase separation/sedimentation.

(6) The Chemistry and Manufacturing data volume should include discussion of all stability results, particularly any that do not comply with generally accepted performance criteria for the test parameters. FAO provides guidance on what acceptable performance generally looks like for each physical parameter.

(7) If results do not comply with generally accepted performance criteria, additional information or arguments will be required to address this and/or demonstrate why actual performance in the field will be better than suggested by the test and any other risk mitigation measure proposed. If it is proposed that any risks identified during the stability testing can be managed using label directions, the practicality of the proposed directions should be explained.

(8) All Product specifications (and any additional QC specifications, not included in Product specifications) should be tested before and after storage. Full details of the analytical methods used for each of the parameters should be provided. If different methods are used to those used for Product/QC specifications, validation should be provided (see 5.5.1).

(9) The batch tested should be a production batch or a batch of the same composition and otherwise representative of a production batch in terms of process (i.e., a laboratory or pilot scale batch which simulates equipment, procedures and controls). A technical argument discussing the similarity of the equipment, procedures and controls is expected if a production batch is not used.

Additional Guidance

- Discussion comparing the initial (t=0) results for the laboratory/pilot batch with batch analysis results from a production batch may also help to provide assurance that results are representative and that there are not likely to be differences in properties with scale-up. Stability data generated on batch sizes of less than five kilograms or five litres are normally not acceptable (even with an argument).

(10) If multiple formulations are proposed, data should be generated for each.

(11) If multiple packaging types are proposed, data should be generated for each.

(12) The condition of the containers should be examined at the beginning and end of the study to determine any obvious signs of package failure or deterioration. You should note and discuss any adverse effect of formulations on the containers in the stability report.

5.4.2 Stability study conditions

(1) Stability studies may be conducted as either accelerated and/or real time studies.

(2) Selection of stability study regime should take into consideration whether accelerated conditions are appropriate for the product. For example, if the active ingredient or formulation is heat sensitive or the product has the ability to cake over time, is susceptible to moisture or is subject to changes in contamination from bacterial or fungal growth, accelerated stability would not be suitable to demonstrate the stability of the product; in this case, real-time stability testing would be appropriate.

Additional Guidance

- Stability tests at elevated temperatures are designed to increase the rate of chemical degradation or the physical change of a product. Data from an accelerated study can give a useful indication of a product's stability; note however that in some cases products may pass this test and yet still be unstable after long-term storage (e.g., after 2 years at ambient temperature).

(3) The active ingredients/product types listed below require real time studies:

a) organisms (e.g., bacteria, viruses, algae or protozoa)
b) Mancozeb, including testing for ethylene thiourea
c) Acephate, including testing for O,O,S-trimethylphosphorothioate
d) Diazinon, including testing for O,O,O',O'-tetraethyl thiopyrophosphate (O,S-TEPP) and O,O,O',O'-tetraethyl dithiopyrophosphate (S,S-TEPP)
e) Dimethoate, including testing for O,O,S-trimethylphosphorodithioate
f) zineb
g) vapour releasing products
h) compounds where impurities of toxicological concern/toxic degradation products may increase over time

Additional Guidance

- This list is not exhaustive. Consideration should be given to how appropriate accelerated conditions are for the product.

5.4.3 Accelerated studies

(1) These studies should be conducted for 14 days duration at 54°C. This can be considered to be equivalent to 2 years at real time.

(2) Include initial (time = 0 days) and final readings for each batch.

(3) Some formulations may not be stable under these conditions. Alternative time/temperature regimes may be proposed, along with a reasoned, scientific case.

Additional Guidance

- If the active content differs by >5% of the initial reading, or there is a change of concern in any parameter, a real time study may be required with testing at regular intervals (typically at least 6-monthly). A suitable fixed temporary shelf-life or expiry date may also be imposed and/or other controls or expectations which will be explained in the specific advice to applicant. If any interim results during real time testing suggest that the product may fall out of specification before the end of the study the ACVM team should be notified immediately

5.4.4 Real Time studies

(1) These studies should be performed at either ambient temperature or at, or above, 25°C. Ambient temperature studies should reflect the minimum and maximum temperature that the trade name product is likely to face throughout its lifetime. However, if the product is to be stored under special conditions during use (e.g., frozen or under refrigeration), the stability data should be generated under the same conditions.

(2) Provide the temperature data over the stability study.

(3) Include initial (time = 0 days) and final readings for each batch. For all products it is recommended to include interim time points (typically at least 6-monthly).

Additional Guidance

- Where both accelerated and real time stability studies are carried out, all data should be submitted with the application.

5.4.5 Cold-stability testing

(1) Where cold stability testing is required, it should be carried out at 0 ±2 ˚C or lower for seven days (CIPAC method 39.3). See Appendix 1 for when this is required.

5.4.6 Toxicologically significant impurities and degradation products

(1) Where toxicologically significant impurities and degradation products may increase over storage, the level of these impurities should be analysed at the commencement and throughout the product storage stability study. Refer to 5.2.11.

5.5 Analytical methods

(1) You should provide the analytical methods used for testing the active ingredient, formulated product, and stability samples (including those for toxicologically significant impurities/degradation products). The method should provide sufficient information that a second laboratory could repeat the documented test and obtain similar results.

(2) The methods of analysis should be appropriate for the type of active ingredient and, for formulations, the matrix of the product.

(3) If methods are published by CIPAC, state the method reference number in full. However, any variation to the standard method should be provided in full.

(4) The following information should be included in a written analytical method:

a) a copy of the actual laboratory method. If this laboratory method is not in English, please include an English version
b) identification of the analytical method – i.e., unique method identifier
c) the method summary
d) sample preparation techniques
e) equipment and reagents
f) purity of reference standard(s), source and batch number of reference standard(s) (if appropriate)
g) worked examples of all calculations
h) For chromatographic methods,

i) details of the column (including column name, manufacturer, packing material and dimensions)
ii) eluent (including gradients, where applicable)
iii) column temperature
iv) detector and retention times of all components
v) system suitability
vi) representative chromatograms (solvent blank, formulation matrix blank where applicable, reference standard and sample) including retention times
vii) peak-assignment and peak-integration data
viii) original printouts from the chromatographic system which include retention times, peak areas and peak-height tables.

5.5.1 Validation data

(1) You should provide validation data for the different methods used for the determination of active ingredient concentration in both the active ingredient and the formulated product (and stability studies if different) and, where appropriate, relevant impurities. If the method is a CIPAC method, only selectivity and accuracy data are required.

(2) A method validation, method transfer or partial revalidation should be provided from each site where the method is used.

Additional Guidance

- For test methods validated at one site, full re-validation is not required at additional sites - method transfer confirmed by comparative testing between the laboratories or partial revalidation can be supplied (including accuracy at a minimum).

(3) The following parameters should be addressed for method validation:

	Assay of active content in active ingredient	**Assay of toxicologically significant impurities in active ingredient or formulated product**	**Assay of active content in formulated product**
Selectivity or specificity	Yes	Yes	Yes
Linearity	Yes	Yes	Yes
Range	May be recommended, depending on the nature of the specific test	Yes	Yes
Precision	Yes	Yes	Yes
Accuracy (recovery)	No	Yes	Yes
Limit of detection (LOD)	No	Yes	No
Limit of quantification (LOQ)	No	Yes	No

(4) Acceptance criteria for each parameter are required to be stated.

a) Selectivity or specificity
Specificity/selectivity of a method is the extent to which the method can determine particular analyte(s) in a mixture without interference from other components in the mixture.
This is demonstrated by producing data to show the absence of interference peaks:
- a matrix blank chromatogram (i.e., formulated product without active, or for multi active products – all actives except for test active) compared to a spiked matrix chromatogram
- assessed by examination of peak homogeneity or peak purity test (e.g., diode array, mass spectrometry) to show that the analyte chromatographic peak is not attributable to more than one component

b) Linearity
Linearity is the ability of the method to produce test results that are proportional to the concentration of analyte in samples within a given concentration range.
Linearity should be determined by using duplicate determinations at 3 or more concentrations, or a single determination at five or more concentrations across approximately 80% - 120% of the range of the specific analytical procedure/test method.
A typical calibration plot, the equation of the calibration curve and the corresponding correlation coefficient (r) must be reported, meeting the r= >0.99 linearity requirements.

c) Range
The specified range should be reported for which it has been demonstrated that the analytical method has suitable levels of precision, accuracy and linearity.

d) Precision (repeatability)
Precision is the closeness of agreement between a series of measurements obtained from multiple samplings of the same homogeneous sample under the prescribed conditions.
Precision should test a minimum of **5 replicate** sample determinations with the same method, on identical test material, on the same equipment, by the same operator in the same laboratory within short internals of time.

Acceptance limits for determination of precision:

Component measured in sample (%)	Precision (percent relative standard deviation (%RSD)
>10	≤2
1 to 10	≤5
0.1 to 1	≤10
<0.1	≤20

e) Accuracy (recovery)
Accuracy is a measure of how close the experimental value is to the true value over a specific range.
Report as percent recovery of known amount of analyte added or as the difference between the mean and the accepted true value together with the confidence intervals. Accuracy should cover a minimum of **3** concentrations (with **3** replicates of each) covering the specified range of the procedure/method.
Acceptance limits for determination of mean recovery:

Active or impurity content (%)	Acceptable mean recovery (%)
>10	98 – 102
10 to 1	90 – 110
0.1 to 1	80 – 120
<0.1	75 – 125

f) Limit of detection (LOD)
The LOD of an analytical method is the lowest amount of an analyte that can be detected (but not necessarily quantitated).
The lowest concentration that produces a detectable peak response corresponding to the analyte should be normally measured with between 6 and 10 replicates. You should calculate the average response (X) and the standard deviation (SD).
The LOD is X + (3 × SD).

g) Limit of quantification (LOQ)
The LOQ of an analytical method is the lowest amount of an analyte that can be quantitatively determined with defined precision under the stated experimental conditions.
LOQ may be determined by measuring a reference standard solution that was estimated during a preliminary study. The solution is normally injected and analysed with between 6 and 10 replicates. You should calculate the average response (X) and the standard deviation (SD) as a per cent (%RSD) of the results. The %RSD should be less than 20%. If the %RSD exceeds 20%, you should prepare a new standard solution of higher concentration and repeat this procedure.
The LOQ is X + (10 × SD).

(5) If the above requirements are not followed, state which internationally recognised validation guidance and acceptance criteria is used. APVMA Validation of analytical methods for active constituents and agricultural products and EU (SANCO 3030) guidelines are accepted, otherwise, justification for the acceptance criteria is to be provided.

(6) Ensure that the validation report includes a summary of the conclusions including whether the acceptance criteria have been met. Any deviations or issues found during validation should be discussed and an explanation provided in terms of why the method is still considered to be 'fit for purpose'.

(7) For chromatographic methods, the validation report should include all raw data used to generate the final results (i.e., peak areas) and some example chromatograms (including solvent blank, matrix blank

if used for specificity, standard and sample). Chromatograms showing separation of impurities should be provided.

a) Chromatograms should be clearly labelled and show:

i) sample identification
ii) peak identity
iii) peak integration
iv) a software-generated table with retention time and peak area of associated peaks

(8) For non-chromatographic methods the above principles still apply.
For example, a titration method validation should include determination of the specificity, linearity, accuracy, and precision. Before the method validation, it is necessary to standardize the titrant in order to achieve accurate results. In cases where specificity cannot be met with titration, it is necessary to complement the titration by other techniques.

Additional Guidance

- To determine impurities in the active ingredient, reference standards should be prepared for each of the identified impurities, particularly those known to be toxic, and the concentration of impurities should be quantitated against their own reference standards.
- It is acceptable to use the active ingredient of known purity as an external standard to estimate the levels of impurities (diluted to the appropriate concentration), provided the response factors of those impurities are sufficiently close (90 per cent or more) to that of the active ingredient. In cases where the response factor is not close, it may still be acceptable to use the active ingredient provided a correction factor is applied. You should provide the rationale for when and how a correction factor is used.

6 Variations to a registered trade name product

6.1 General variation information

(1) The registrant should consider the effects of every Chemistry and Manufacturing change to a registered trade name product in respect to all risk areas under the ACVM Act and the potential to impact on the consistency or quality of the product.

(2) Applications to vary the details of a registered trade name product are required whenever there is a change to the approved product information. Where more than one change is proposed, refer to all relevant sections below - e.g., where a new formulated product manufacturer is being added, this may also include a change in manufacturing process and change in specifications, and the information in sections 6.5.1, 6.6.1 and 6.7.1 would need to be provided.

Additional Guidance

- Some variations may prompt a new registration. Refer to **Guidance Document: Agricultural Chemical Registration**.
- Applications must be submitted and approved **prior** to the release of the changed product for sale in New Zealand

(3) Data and/or technical rationale/explanation for the variation(s) should be provided. An acceptable technical rationale for deviation from data requirements will include discussion of the proposed change relative to the information or parameter currently approved, and potential impacts on quality, stability, efficacy, safety or residue profile of the product. If there is little or no impact, explain why you have determined this to be so.

(4) For all variations except C9 administrative and self-assessable changes, provide:

a) Relevant application form(s)
b) Product Data Sheet
c) Label (clean version and amendments highlighted version)
d) Discussion on any areas affected by the proposed change, including risk profile: i.e., physical and chemical properties, quality, stability, residues, target crop safety and efficacy of the TNP
e) Data assessment report (if required, see 6.1 (5))
f) Any additional information specified below for each variation type, with any differences from currently approved information highlighted.

(5) Data assessments are required:

a) Where data are provided for addition/change of formulation composition which also involves additional variations (e.g., change/addition of manufacturer(s), change in specifications)
b) Otherwise, for variations with large amounts of data, ACVM may request data assessment.

(6) For all C9 administrative changes, provide:

a) Relevant application form including identifying specific changes made
b) Product Data Sheet
c) Label (clean version and amendments highlighted version).

(7) For all self-assessable changes, advise ACVM of the change at the next variation or registration renewal application and provide:

a) A declaration of self-assessable change made in covering letter/email, including the date the change(s) were made
b) Any additional information, as specified below for each variation type.

Additional Guidance

- Ensure the PDS provided at the next variation includes the self-assessed change.

6.2 Changes to approved formulation details

(1) When making an application for changes to the formulation composition, in addition to the information outlined in 6.1 (4) provide:

a) Explanation for the change
b) Current formulation table and proposed formulation table. Refer to information under section 5.2.5 regarding excipient information
c) Updated manufacturing process flowchart and/or description, if the manufacturing process has changed
d) Product specifications, QC specifications, and associated test method(s)/method validation(s), if these have changed
e) Batch analysis data – as specified in section 5.2.10
f) Stability data to support formulation changes that impact on the stability of the product – as specified in section 5.4.

Additional Guidance

- Adding or removing an active ingredient(s) is not a variation to an existing product. If such a change is proposed for a previously approved formulation composition, the new formulation composition is considered a new trade name product, and you should submit an application to register that product.
- Refer to section 5.2.6 if adding an alternate formulation composition.

6.3 Changes to approved active ingredient manufacturer(s)

6.3.1 Adding or replacing an active ingredient manufacturer / active ingredient testing site

(1) When making an application to add an additional active ingredient manufacturer/testing site, or to replace a currently approved active ingredient manufacturer/testing site with another, in addition to the information outlined in 6.1 (4) provide:

a) Details of the proposed manufacturing site(s) as specified in section 5.1.1, including current manufacturers and whether they are to be retained or removed
b) Specifications of the active ingredient from the new manufacturer(s) – see section 5.1.4 and 5.1.5
c) Batch analysis data – as specified in section 5.1.8, including analytical test methods, and validation.

6.3.2 Removing an active ingredient manufacturer / active ingredient testing site (if only one site is approved)

(1) When making an application to remove the sole active ingredient manufacturer and/or QC testing site, in addition to the information outlined in 6.1 (4) provide:

a) Covering letter/email stating reason for removal of the site.

Additional Guidance

- MPI may apply a condition of registration and/or shortened registration expiry date to manage the risk of not having an approved manufacturer of the active ingredient.

6.3.3 Removing an active ingredient manufacturer / active ingredient testing site (if 2 or more sites are approved)

(1) C9 Administrative change. No additional information required beyond information outlined in 6.1 (6).

6.3.4 Change in name of active ingredient manufacturer(s)

(1) C9 Administrative change

(2) In addition to the information outlined in 6.1 (6) provide:

a) Evidence of name change (e.g., letter from manufacturer on letterhead)
b) A declaration that the only change is to the name.

6.4 Changes to approved active ingredient(s)

6.4.1 Change in name of active ingredient

The active ingredient should remain the same, and there should be no other change to the information previously supplied for that ingredient.

(1) When making an application for change in active ingredient name, in addition to the information outlined in 6.1 (4) provide:

a) Evidence of name change.

6.4.2 Changes to active ingredient(s) specification(s)

(1) Changes to the active ingredient(s) specification(s) include changes to the parameters for purity and impurities, acceptance criteria and analytical test methods. In addition to the information outlined in 6.1 (4) provide:

a) Explanation for the change
b) Current active ingredient specification table and proposed specification table
c) Batch analysis data on minimum of three batches of active ingredient, at least one produced in the last 5 years. The data should include supporting information as specified in section 5.1.8, including analytical test methods, and validation if applicable.

6.5 Changes to approved formulated product manufacturer(s)

6.5.1 Adding or replacing a formulated product manufacturer

(1) When making an application to add an additional manufacturing site, including QC testing sites, or to replace a currently approved manufacturing site with another, in addition to the information outlined in 6.1 (4) provide:

a) Details of the proposed manufacturing site(s) as specified in section 5.3.1, including current manufacturers and whether they are to be retained or removed
b) Declaration that the raw materials, active ingredient manufacturers, formulation composition, manufacturing process, QC and Product specifications and packaging are identical to that currently approved, or
Information to demonstrate the proposed manufacturing site(s) will manufacture the product equivalent to that currently approved, along with the additional variation(s) addressing any differences (see 6.1 (2)).
c) Associated methods and method validation/method transfer, see section 5.5
d) Batch analysis data on a minimum of one batch of the TNP from the proposed manufacturer, as specified in section 5.2.10.

(2) If multiple formulations are proposed, it should be clear in submitted documentation which manufacturer manufactures which formulation.

6.5.2 Removing a formulated product manufacturer (if only one site is approved)

(1) When making an application to remove the sole formulated product manufacturer and/or QC testing site, in addition to the information outlined in 6.1 (4) provide:

a) Covering letter/email stating reason for removal of the site.

Additional Guidance

- MPI may apply a condition of registration and/or shortened registration expiry date to manage the risk of not having an approved manufacturer of the formulated product.

6.5.3 Removing a formulated product manufacturer (if 2 or more sites are approved)

(1) C9 Administrative change. No additional information required beyond information outlined in 6.1 (6).

6.5.4 Adding a repacker/relabeller only

(1) C9 Administrative change.

(2) In addition to the information outlined in 6.1 (6) provide:

a) Details of the proposed manufacturing site(s) as specified in section 5.3.1.

6.5.5 Change in name of formulated product manufacturer(s)

(1) This change is a C9 administrative change provided that the formulated product remains the same, and there should be no other change to the information previously supplied for that manufacturer.

(2) In addition to the information outlined in 6.1 (6) provide:

a) Evidence of name change
b) A declaration that manufacturing site, raw materials, active ingredient manufacturers, formulation composition, manufacturing process, QC and Product specifications and packaging have not changed with the change in name.
If any of these have changed, the change will not be C9 administrative and the relevant variation(s) will need to be submitted.

6.6 Changes to manufacturing process and quality control

6.6.1 Changes to manufacturing process and/or quality control

(1) When making an application if it is proposed to change the details of the currently approved manufacturing process or any quality control procedures, in addition to the information outlined in 6.1 (4) provide:

a) The reason for the change(s) and the expected impact(s) the change(s) will have on the quality and stability profile of the product
b) Batch analysis (see section 5.2.10), to support the proposed change (for each manufacturing site (& formulation for that site) impacted)
c) If more than one manufacturing process has been nominated for the manufacture of the trade name product, demonstrate that changes that impact one of the processes will not negatively impact the batch-to-batch and site-to-site consistency of the manufacture of the product across all approved sites.

(2) This includes changes to any point of the manufacturing process itself, in-process critical control points and/or analytical methods, equipment type used, and any details in the process and control procedures that may impact the risk profile or quality of the product.

6.7 Changes to formulated product specification or test methods

6.7.1 Changes to formulated product specification or test methods

(1) When making an application if it is proposed to change any parameter or test method currently approved in the formulated product QC and/or product specifications, in addition to the information outlined in 6.1 (4) provide:

a) Reason for the proposed change
b) Current QC / product specification table and proposed QC / product specification table
c) Batch analysis data – as specified in section 5.2.10
d) For changes to analytical test methods, provide method and validation (where appropriate) for the proposed method. Refer to section 5.5 for details.

6.8 Changes to product packaging

6.8.1 Change in composition of primary packaging

(1) When making an application for any proposed change to the product packaging including primary packaging materials, closures, packaging specifications, in addition to the information outlined in 6.1 (4) provide:

a) Details of the proposed packaging as specified in section 5.2.9, including current packaging and whether it is to be retained or removed
b) The reason for the change(s) and the expected impact(s) the change(s) will have on the product properties including the quality and stability profile of the product (e.g., photosensitivity, temperature, oxygen or moisture sensitivity, and any other relevant parameters). Relate these impacts to any potential impacts on the efficacy, safety and residue risk profile of the product
c) Stability data to demonstrate that the product will remain stable throughout the approved shelf life, if the changes in the primary packaging materials are significantly different to that approved for the product.

6.8.2 Change in pack size

(1) When making an application for any proposed changes to the pack size range, or addition of pack sizes outside of the approved pack size range or where no pack size range is specified, in addition to the information outlined in 6.1 (4) provide:

a) Packaging specification data on the new pack size(s), refer to section 5.2.9
b) If the proposed pack size is smaller than the currently approved pack sizes, then product stability needs to be addressed either with data or justification
c) If the proposed pack size is larger than the currently approved pack sizes, product stability needs to be addressed either with data or justification, based on the product type and its practical use in the market. For example, if the formulation type is a suspension concentrate there is the possibility of sedimentation/separation.

6.8.3 Addition of a new marketed pack size within the currently approved size range

(1) Self-assessable change. No additional information required beyond information outlined in 6.1 (7).

Additional Guidance

- The addition of the new marketed pack size must be within the approved pack size range, and be of the same composition as the currently approved pack size range

6.8.4 Change in secondary packaging

(1) When making an application for any proposed changes to the secondary packaging, in addition to the information outlined in 6.1 (4) provide:

a) Details of the change including packaging specification information as applicable
b) Where the secondary packaging **serves to protect or preserve product quality** (and/or the integrity of sensitive primary packaging such as water-soluble bags) provide a technical rationale explaining the reason for the change(s) and the expected impact(s) the change(s) will have on the product properties, see section 5.2.9 (4) . Provide stability data and information to support the change if appropriate.

6.8.5 Removal of pack size (if 2 or more sizes are approved)

(1) C9 Administrative change. No additional information required beyond information outlined in 6.1 (6).

6.9 Changes to shelf life of the trade name product

6.9.1 Changes to shelf life of a trade name product

(1) When making an application for any proposed changes to the shelf life of the trade name product, in addition to the information outlined in 6.1 (4) provide:

a) Current shelf life (in months) and proposed shelf life (in months)
b) Stability data to support the change in shelf life as specified in section 5.4
c) Product specification, QC specification.

Appendix 1: Chemical and Physical Parameters Based on Formulation Type

Additional Guidance

- If your formulation type is not listed in Appendix 1 or the FAO manual, use the one that bears the closest resemblance to the formulation type required and justify this selection (see CropLife International, *Catalogue of pesticide formulation types and international coding system* for coding of unusual formulations to assist with determining closest resemblance).
- Packaging stability is not considered a Product or QC specification (only required as a stability trial parameter), although inclusion of a packaging specification should be considered (e.g., no significant degradation or distortion).
- Where a revised CIPAC MT method has been adopted by CIPAC, supersedes a previous version and is deemed to provide equivalent results, the revised MT methods should be used

BAITS: INCLUDING BAIT CONCENTRATE (CB), BAIT (READY TO USE) (RB)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Retention of palatability	Only required if significant physical changes were observed on storage
Packaging stability	Observation of packaging stability and integrity

CAPSULE SUSPENSION (CS)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Free (non-encapsulated) active content (if required)	Appropriate validated method; Only required for slow- or controlled-release properties
Release rate of active ingredient (if required)	Appropriate validated method; Only required for slow- or controlled-release formulations
Acidity/alkalinity or pH	MT 75.3 or MT 191
Pourability	MT 148.1
Suspensibility	MT 184.1
Spontaneity of dispersion	MT 160
Wet sieve test	MT 185
Persistent foam	MT 47.3
Particle size distribution	MT 187
Packaging stability	Observation of packaging stability and integrity
Freeze/thaw stability	Testing of stability parameters required after freeze/thaw cycle*

* The freeze/thaw stability test shall cycle the formulation between room temperature (e.g., 20 ± 2°C) and -10 ± 2°C on 18-hour-freeze/6-hour-melt cycles for a total of 4 cycles.

DUSTABLE POWDER (DP)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Dry sieve test	MT 170
Packaging stability	Observation of packaging stability and integrity
Other	Observation of caking (there should be no caking on storage)

EMULSIFIABLE CONCENTRATE (EC) and EMULSION (WATER IN OIL) (EO)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Emulsion stability and re-emulsification	MT 36.3
Persistent foam	MT 47.3
Packaging stability	Observation of packaging stability and integrity
Stability at 0˚C	MT 39.3

EMULSION, OIL IN WATER (EW)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Emulsion stability and re-emulsification	MT 36.3
Pourability	MT 148.1
Persistent foam	MT 47.3
Packaging stability	Observation of packaging stability and integrity
Stability at 0˚C	MT 39.3
Other	On standing, emulsions may develop a concentration gradient, including sedimentation or layering. If there is sedimentation or layering it should be confirmed that shaking or inverting before use resolves the problem and if so, a label statement should be included relative to this

FLOWABLE CONCENTRATE FOR SEED TREATMENT (FS)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Pourability	MT 148.1
Wet sieve test	MT 185
Persistent foam (if required)	MT 47.3; Persistent foam is not applicable if used without dilution or at a dilution rate higher than the scope of the method MT 47.3 (10 %) and an alternative method should be used
Suspensibility (if required)	MT 184.1; Suspensibility is not applicable if used without dilution or at a dilution rate higher than the scope of the method MT 184.1 (10 %) and an alternative method should be used
Adhesion to seeds	MT 194
Packaging stability	Observation of packaging stability and integrity
Stability at 0˚C	MT 39.3
Other	Observation on claying, sedimentation and re-dispersibility (there should be no claying, sedimentation or re-dispersibility issues on storage)

GEL FOR DIRECT APPLICATION (GD)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Packaging stability	Observation of packaging stability and integrity
Stability at 0˚C	MT 39.3

GRANULES (GR)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Release rate of active ingredient (if required)	Appropriate validated method; Only required for controlled-release granules
Acidity/alkalinity or pH	MT 75.3 or MT 191
Pour and tap density	MT 186
Nominal size range	MT 170
Dustiness	MT 171.1
Flowability	MT 172.2
Attrition resistance	MT 178
Packaging stability	Observation of packaging stability and integrity
Other	Observation on granule integrity and caking (there should be no loss of granule integrity or caking on storage)

LIQUID (READY TO USE)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Packaging stability	Observation of packaging stability and integrity
Other	Parameters appropriate to the particular liquid type should be considered

OIL MISCIBLE LIQUID (OL)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Miscibility with hydrocarbon oil	MT 23
Packaging stability	Observation of packaging stability and integrity
Stability at 0˚C	MT 39.3

POWDER FOR DRY SEED TREATMENT (DS)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Adhesion to seeds	MT 194
Dry sieve test	MT 170
Packaging stability	Observation of packaging stability and integrity

SOLUBLE CONCENTRATE (SL)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Dilution stability	MT 41.1
Persistent foam	MT 47.3
Packaging stability	Observation of packaging stability and integrity
Stability at 0˚C	MT 39.3

SUSPENSION CONCENTRATE (SC)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Pourability	MT 148.1
Suspensibility	MT 184.1
Spontaneity of dispersion	MT 160
Wet sieve test	MT 185
Persistent foam	MT 47.3
Packaging stability	Observation of packaging stability and integrity
Stability at 0˚C	MT 39.3
Other	Observation on claying, sedimentation and re-dispersibility (there should be no claying, sedimentation or re-dispersibility issues on storage)

SUSPO-EMULSION (SE)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Dispersion stability	MT 180
Pourability	MT 148.1
Wet sieve test	MT 185
Persistent foam	MT 47.3
Packaging stability	Observation of packaging stability and integrity
Stability at 0˚C	MT 39.3
Other	On standing, emulsions may develop a concentration gradient, including sedimentation or layering. If there is sedimentation or layering it should be confirmed that shaking or inverting before use resolves the problem and if so, a label statement should be included relative to this

TABLETS (TB)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Tablet dose uniformity	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Tablet Integrity	No broken, soft or sticky tablets should be present
Tablet hardness	No CIPAC method
Attrition resistance of tablets (if required)	MT 178.2; Only required for tablets with a diameter ≤ 1 cm
Solution properties of water-soluble tablets *	MT 196; Only for water-soluble tablets
Suspensibility #	MT 184.1; Only for water-dispersible tablets
Wet sieve test #	MT 185; Only for water-dispersible tablets
Persistent foam # *	MT 47.3; Only for water-soluble and water-dispersible tablets
Disintegration of tablets # *	MT 197; Only for water-soluble and water-dispersible tablets
Packaging stability	Observation of packaging stability and integrity

* If the tablet is water-soluble (WS), then solution properties of water-soluble tablets, persistent foam and disintegration of tablets should also be tested.

If the tablet is water-dispersible (WT), then suspensibility, wet sieve test, persistent foam and disintegration of tablets should also be tested.

WATER-DISPERSIBLE GRANULES (WG)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Wet sieve test	MT 185
Dispersibility	MT 174
Suspensibility*	MT 184.1
Wettability	MT 53.3
Persistent foam*	MT 47.3
Dustiness	MT 171.1
Flowability	MT 172.2
Attrition resistance	MT 178.2
Dissolution of water-soluble bags	MT 176; Only for the product packaged in a sealed water-soluble bag
Packaging stability	Observation of packaging stability and integrity

*If the product is packaged in a water-soluble bag, you should do the suspensibility and persistent foam test using a solution of the product and water-soluble bag in the same ratio as in the recommended application.

WATER-DISPERSIBLE POWDER FOR SLURRY SEED TREATMENT (WS)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Wet sieve test	MT 185
Wettability	MT 53.3
Persistent foam	MT 47.3
Adhesion to seeds	MT 194
Packaging stability	Observation of packaging stability and integrity

WATER-SOLUBLE GRANULES (SG)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Dustiness	MT 171.1
Degree of dissolution and solution stability*	MT 179.1
Persistent foam*	MT 47.3
Attrition resistance	MT 178.2
Dissolution of water-soluble bags	MT 176; Only for the product packaged in a sealed water-soluble bag
Packaging stability	Observation of packaging stability and integrity

*If the product is packaged in a water-soluble bag, you should do the degree of dissolution and solution stability and persistent foam test using a solution of the product and water-soluble bag in the same ratio as in the recommended application.

WATER-SOLUBLE POWDER (SP)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Persistent foam*	MT 47.3
Wettability	MT 53.3
Degree of dissolution and solution stability*	MT 179.1
Dissolution of water-soluble bags	MT 176; Only for the product packaged in a sealed water-soluble bag
Packaging stability	Observation of packaging stability and integrity

*If the product is packaged in a water-soluble bag, you should do the persistent foam and degree of dissolution and solution stability test using a solution of the product and water-soluble bag in the same ratio as in the recommended application.

WETTABLE POWDER (WP)

Expected Test Parameters	Relevant CIPAC Method/Comments
Appearance (physical state, colour)	
Active content	Appropriate validated method
Acidity/alkalinity or pH	MT 75.3 or MT 191
Wet sieve test	MT 185
Suspensibility*	MT 184.1
Wettability	MT 53.3
Persistent foam*	MT 47.3
Dissolution of water-soluble bags	MT 176; Only for the product packaged in a sealed water-soluble bag
Packaging stability	Observation of packaging stability and integrity
Other	Observation on caking (there should be no caking on storage)

*If the product is packaged in a water-soluble bag, you should do the suspensibility and persistent foam test using a solution of the product and water-soluble bag in the same ratio as in the recommended application.