

Specialist Manual for the Selection, Assembly, and Compliance of High-Pressure Hydraulic Hose Systems in Australian Mining, Construction, and Agricultural Environments

In the modern Australian industrial landscape, the role of a specialist importer and reseller of high-pressure hydraulic hoses and fittings carries a significant burden of responsibility.

Recent trends indicate that businesses operating within this sector have faced escalating challenges from insurance providers and compliance authorities.¹

These challenges stem primarily from allegations of failing to provide adequate training and comprehensive information regarding the selection, use, and assembly of products according to specified manufacturer tolerances.

In a field where pressures can exceed 10,000 PSI, the margin for error is non-existent, and the consequences of a failure can range from catastrophic environmental damage to fatal high-pressure fluid injection injuries.³

This manual is designed to bridge that gap, providing a definitive guide for technicians, resellers, and end-users to ensure every assembly is safe, compliant, and durable.

Safety Protocols and Professional Standards

Safety is not merely a checkbox in the hydraulic industry; it is the fundamental framework within which all operations must occur.

Under the Australian Workplace Health and Safety Act, technicians have a mandatory obligation to notify owners or operators of any unsafe conditions or potential for premature failure in hose assemblies.⁵

Professionalism begins with the technician's appearance and the maintenance of their equipment. Wearing the correct attire, including high-visibility or reflective clothing, is mandatory on the majority of Australian worksites, from construction zones to remote mine sites.⁵

Safety footwear is non-negotiable and must be compatible with the materials being handled; given that oil is the primary substance in hydraulics, footwear should be oil-resistant to prevent slips and material degradation.⁵

Furthermore, eye protection is required not just during mechanical tasks like grinding or buffing, but at all times when dealing with high-pressure systems, whether the pressure is static or fluctuating.

Hearing protection becomes essential when working in factory environments or near heavy machinery like rock breakers or drilling rigs on-site.⁵

Machine and Site Safety Procedures

Before any work begins, a comprehensive site assessment is required. This includes positioning the service vehicle as close as practical to the work area without interfering with other operations, while strictly observing site-specific speed limits and road signs.⁵

A critical rule for all hydraulic technicians is to avoid working on a machine while it is running.

While an operator may need to activate controls to diagnose a leak, once the fault is identified, the engine must be turned off and the machine vacated before the technician commences repairs.⁵

Safety Component	Requirement	Context/Reasoning
Footwear	Steel-capped, oil-resistant	Prevents crushing and slips in oily environments.
Eye Protection	Safety spectacles/Goggles	Essential for both static and fluctuating high pressure.
Site Access	High-visibility clothing	Mandatory on construction and mining sites.
Site Assessment	Site-specific safety officer check	Ensures compliance with local regulations.
Hearing Protection	Mandatory in noise zones	Required near drilling or rock breaking equipment.

Technicians must never start a machine without being 100% certain of the shutdown procedure.

Misunderstandings in this area have historically led to fatalities, particularly when an arm or boom drops unexpectedly.⁵

Additionally, many earthmoving machines utilize pressurised hydraulic tanks.

Releasing the tank pressure is a vital initial step; failure to do so can result in dangerous hot fluid release when a fitting is "cracked".⁵

Diagnosing leaks requires extreme caution; technicians must resist the urge to feel for a leak with their hands.

High-pressure oil can easily pierce human skin, causing deep-tissue damage that may not be immediately obvious but can lead to amputation if the oil enters the bloodstream.³

Environmental Responsibility and Spillage Management

Environmental stewardship is a legal mandate in Australia.

It is a serious offence under environmental legislation to allow hydraulic oil to enter stormwater drainage systems or gutters.⁵

Technicians must use appropriate caps, plugs, and drip trays to minimise spills.

If a spill occurs, the use of oil-absorbing materials or rags is required to ensure the area is fully cleaned.

This commitment to cleanliness extends to the hydraulic system itself; introducing dirt or contaminated oil back into a tank can cause premature failure of pumps and valves, creating a cycle of costly repairs and unsafe operating conditions.⁵

Professional Conduct and Workplace Culture

A specialist reseller's reputation is built on more than technical skill; it is rooted in the culture of the organisation.

A professional environment must be free from harassment, discrimination, and violence.

Policies regarding workplace harassment apply not only to internal employees but also to contractors, clients, and visitors encountered during field service.⁵

This includes a zero-tolerance approach to bullying, victimization, or any conduct that undermines the integrity of the professional relationship.

Ensuring a safe psychosocial environment is as important as physical safety, as it impacts employee morale and performance, which in turn affects the quality of the hose assemblies

being produced.⁵

The S.T.A.M.P.E.D. Method for Component Selection

The S.T.A.M.P.E.D. acronym is an industry-wide practice used to ensure that a replacement or new hydraulic hose assembly is perfectly suited for its intended application.²

By following these seven steps, resellers and technicians can avoid the common pitfalls of mismatching components, which is the leading cause of the compliance and insurance issues currently plaguing the industry.¹

Size: Inner Diameter and Length

Size identification involves measuring the inside diameter (I.D.), the outside diameter (O.D.), and the overall length (O.A.L.) of the assembly.²

The internal diameter is the most critical factor for maintaining proper flow velocity. If the I.D. is too small for the Liters per Minute (Lt/min) requirement of the pump, it causes excessive turbulence, heat buildup, and pressure drops that can damage the entire system.²

Hose sizes are traditionally expressed in "dash" sizes, based on $\frac{1}{16}$ -inch increments.

For instance, a -04 hose is $\frac{4}{16}$ (1/4 inch), and a -16 hose is $\frac{16}{16}$ (1 inch).⁵

Technicians must also account for the length of the fittings when calculating the "cut-off" length of the hose to achieve the correct overall length for the final assembly.⁷

Temperature: Ambient and Media

The technician must evaluate both the temperature of the fluid being conveyed and the ambient temperature of the surrounding environment.²

High-temperature fluids can degrade the inner tube of a standard hose, while extreme ambient heat (common in Australian summers or near hot engine components) can cause the outer cover to become brittle and crack.²

Selecting a hose with a rating that exceeds the maximum expected temperature is a critical safety margin.²

Application: Environmental Stress and Routing

Application refers to where and how the hose will be used.

Will it be subject to constant flexing?

Is it in an area where it might rub against other hoses or machine parts?²

If abrasion is a risk, a hose with a specialised tough cover (like the Gates XtraTuff or Ryco

Diehard) is required.¹¹

Routing also plays a role; using 45° or 90° adaptors can prevent sharp bends that lead to premature failure.⁵

Material/Media: Chemical Compatibility

The media is the substance flowing through the hose.

While most hydraulic systems use mineral-based oils, others may use synthetic fluids, biodegradable oils, or even corrosive chemicals.²

The hose's inner lining must be chemically compatible with the media to prevent the lining from swelling or breaking down, which would contaminate the system and lead to a burst.²

Pressure: Working and Surge Ratings

Pressure is perhaps the most non-negotiable part of the STAMPED method. The hose must be rated for the system's maximum working pressure, and it must also be able to handle pressure surges or spikes.²

Most hydraulic hoses are designed with a **4 : 1** safety factor, meaning the minimum burst pressure is four times the working pressure.⁵

Hose Dash Size	Fractional Size (inches)	Decimal Size (mm)	Common Application
-04	1/4"	6.3 mm	Small implements, steering
-06	3/8"	9.5 mm	General medium pressure
-08	1/2"	12.7 mm	Standard high pressure
-12	3/4"	19.1 mm	Large earthmoving circuits

-16	1"	25.4 mm	High-flow return/pressure
-32	2"	50.8 mm	Large suction/return

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Ends: Fitting and Thread Identification

The "Ends" refer to the fittings and thread types needed to connect the hose to the machine.

Common types in Australia include JIC (American), BSP (British), and Metric (European).²

Mixing different thread types, even if they appear similar, is a catastrophic mistake that will lead to high-pressure leaks and blow-offs.²

Delivery: Documentation and Traceability

The final "D" stands for Delivery, but in a compliance-driven market, it also encompasses documentation and tagging.²

Professionally assembled hoses must be tagged with unique serial numbers, manufacture dates, and pressure ratings to ensure traceability for insurance and safety audits.²

Identification of Hose Types and Constructions

Understanding the internal anatomy of a hydraulic hose is essential for matching it with the correct fittings and crimp settings.

A hose typically consists of three parts: the inner tube (carries the fluid), the reinforcement (provides strength), and the cover (protects against the environment).⁵

Braided Reinforcement: Medium to High Pressure

Braided hoses are reinforced with one or two layers of high-tensile steel wire.

These are the most common hoses in general industry and agriculture due to their flexibility and cost-effectiveness.⁸

- **SAE 100R1 (Single Wire Braid):** Used for medium-pressure hydraulic systems, return lines, and fuel lines.⁵
- **SAE 100R2 (Double Wire Braid):** The industry standard for high-pressure hydraulics on mobile equipment.⁵

Spiral Reinforcement: Ultra-High Pressure

Spiral hoses are reinforced with four or six layers of steel wire wound in a spiral pattern.

Unlike braided wires, which cross over each other, spiral wires remain parallel in each layer.

This construction is required for ultra-high pressure applications where there are significant pressure surges and "impulses".⁵

- **SAE 100R12:** Four spiral wires, designed for high-impulse heavy machinery.⁵
- **SAE 100R13/100R15:** Extremely high-pressure hoses with four to six spiral layers, commonly used in mining excavators and drill rigs.⁵

Specialty Hoses: Thermoplastic and Teflon

- **SAE 100R7/R8 (Thermoplastic):** Often used in forklift masts because the cover is highly resistant to abrasion from chain rollers.
- These are also non-conductive, making them suitable for cherry pickers working near power lines.⁵
- **SAE 100R14 (Teflon/PTFE):** A stainless steel braided hose with a Teflon inner tube.

These are selected for extreme temperatures (up to 232°C) or highly corrosive chemicals. They have a larger bend radius and must not be kinked.⁵

- **Suction Hose:** Identified by a helical wire vulcanised into the rubber to prevent the hose from collapsing under vacuum.

Technicians must be careful when cutting suction hose, as the spring steel wire can protrude and cause injury; it should be cut back behind the rubber end for safety.⁵

Matching Fittings and Thread Identification Guide

The most critical factor in achieving compliance with Australian standards like MDG41 is the use of a "Matched System".¹²

A matched system means the hose, the tail, and the ferrule (the sleeve that is crimped) are all designed and tested together by the same manufacturer.

While international standards exist, the tolerances are often too loose.

Mixing Manufacturer A's hose with Manufacturer B's fittings can lead to a "bottom-to-top" tolerance mismatch, where the fitting is either too loose (causing a blow-off) or too tight (damaging the reinforcement).¹²

Thread Identification Procedures

Correctly identifying the thread is a three-step process: determining the sealing method, measuring the diameter, and checking the pitch.²

Thread Type	Parallel/Tapered	Flare/Seal Angle	Common Identification Method
JIC	Parallel	37° Flare	American; most common on earthmoving.
BSPP	Parallel	60° Cone	British; seals with O-ring or Dowty washer.
BSPT	Tapered	N/A	Seals on the thread; requires tape/sealant.
METRIC	Parallel	24°/60° Cone	European; uses O-rings or bite-type sleeves.
ORFS	Parallel	Flat Face	O-ring sits in a groove on the male face.
UNO	Parallel	N/A	Same thread as JIC; seals with port O-ring.

Technicians should use a thread gauge to check the number of threads per inch (or mm) and a vernier caliper to check the outside diameter of male threads or the inside diameter of female threads.⁵

Parallel threads typically seal using an O-ring or a metal-to-metal angled face, while tapered threads seal on the thread itself. Tapered threads must be tightened with care; over-tightening can split a valve body or housing.⁵

Safe and Correct Hose Assembly Procedures

Once the correct hose and fittings are selected using the STAMPED method, the assembly process must follow a strict, documented procedure to meet manufacturer tolerances and safety standards.⁵

Step 1: Measuring and Cutting the Hose

Accuracy in measurement prevents hoses from being installed too tightly or with excessive slack.

The preferred measurement for a hose assembly is the Overall Length (O.A.L.), measured from the centreline of angled fittings or the sealing face of straight fittings.⁵

Technicians must subtract the "cut-off" length of the fittings to find the actual length of hose to be cut.⁹

Hose length can change by $+2\%$ to -4% when pressurised.

Therefore, assemblies must include enough slack to allow for expansion and contraction. Clamping should never occur at a bend, as the curves are needed to absorb these changes in length.⁵

Step 2: Cleaning the Hose (Pigging)

Cutting a hose with a saw or grinder introduces rubber and metal debris into the tube.

This debris is a leading cause of hydraulic component failure. The most effective cleaning method is "pigging," where a foam projectile is fired through the hose with compressed air to scrub out all particles.⁹

Step 3: Skiving and Insertion Depth

Some high-pressure hoses require "skiving," where the outer cover is removed so the ferrule can bite directly into the wire reinforcement.

Whether skived or "no-skive," the most critical step is marking the insertion depth.⁹

The technician must mark the hose at the end of the ferrule before crimping. If the mark moves during the crimp process, it indicates the fitting was pushed out, and the assembly is unsafe.⁹

Step 4: Crimping with High-Power Machinery

Crimping (or swaging) is the process of permanently attaching the fitting to the hose using a machine like the ENGMATTEC P32.⁵

- **Die Selection:** Each hose size requires a specific set of dies (or "jaws"). The die number is typically stamped on the front of each piece.⁵
- **Gauge Settings:** The crimping machine uses a dial or digital gauge to control how far the dies close. This setting is based on the manufacturer's "Crimp Chart" for that specific hose/fitting combination.⁵
- **The Crimping Action:** The fitting is placed inside the dies, and the machine is activated. The technician must ensure the fitting is correctly positioned so the entire ferrule is compressed evenly.⁹

Compliance and Verification: MDG41 and RS23

In highly regulated environments like Australian mining, a "made" hose is not a "compliant" hose until it has been verified and tested according to standards like NSW MDG41 or QLD RS23.³

Crimp Diameter Verification

Every crimped fitting must be measured with a calibrated vernier caliper. The measurement is taken on the "flats" of the crimp, halfway down the ferrule.²³ The measured diameter must match the manufacturer's specification within a very tight tolerance (typically ± 0.1 mm to ± 0.2 mm).²⁹ If a technician cannot provide proof of this measurement, the assembly may be deemed non-compliant during an audit.¹

Pressure Testing (Proof Testing)

Under MDG41, all high-risk hose assemblies should be proof tested at two times the maximum working pressure.²² For example, a hose with a 4,000 PSI working pressure must be tested to 8,000 PSI.¹⁸

- **Procedure:** The assembly is connected to a hydrostatic test bench. The pressure is held for 30 to 60 seconds while the technician inspects for any leaks, seepages, or fitting movement.²²
- **Certification:** Successfully tested hoses are issued with a numbered test certificate, which is a vital document for insurance and site compliance.²²

Identification and Tagging Systems

Traceability is a core requirement of RS23 and MDG41. Every compliant hose assembly must have a permanent tag.³

- **Tag Information:** The tag must include a unique serial number, the manufacture date, and the operating pressure.³
- **Colour Coding:** Many sites use a five-year colour-coding system (e.g., GYRBW) to identify at a glance which year a hose was installed. This helps maintenance teams ensure that hoses are replaced before they reach the end of their service life (typically 5 to 8 years).¹⁷

Maintenance, Lubrication, and Failure Prevention

A hydraulic hose's service life depends on the health of the entire hydraulic system. Maintaining the machine and the assembly tools is as important as the assembly itself.⁵

Crimping Machine Maintenance (P16, P20 and P32)

The high-pressure machinery used to create hose assemblies requires its own maintenance schedule to remain accurate.³⁵

- **Lubrication:** The gliding surfaces of the crimp head must be greased every 4 to 8 hours of continuous operation. This prevents "metal-to-metal" contact and ensures the dies close evenly.³⁷
- **Calibration:** The machine should be calibrated at least annually, or more frequently if used in harsh environments. Test crimps should be performed regularly to verify that the dial settings are still producing the correct diameters.²⁶
- **Storage:** Always store the crimping machine in the "full open" position. This protects the die springs from losing their strength over time.³⁷

Hydraulic Fluid and Lubricant Selection

Choosing the correct oil is vital for both the machine and the hose. Lubricants in hydraulic systems serve to transfer power, lubricate moving parts, and dissipate heat.⁵

- **ISO 68 Grade:** The most common oil for general hydraulic systems, suitable for gear, vane, and piston pumps.⁵
- **ISO 46 Grade:** Used in modern, higher-temperature machines.⁵
- **Transmission Oil:** Often red in colour, used in automatic transmissions and power steering units.⁵

Identifying Common Hose Failures

Technicians should be trained to identify signs of imminent failure before a burst occurs.

- **Abrasion:** The outer cover is worn away, exposing the steel reinforcement. This leads to corrosion and weakening of the hose.²
- **Cracking (Ozone Attack):** Small cracks in the outer cover indicate that the rubber has reached the end of its life due to heat or UV exposure.²

- **Fitting Seepage:** Oil appearing between the hose and the ferrule is a sign that the crimp has loosened or the inner tube has degraded.³⁴
- **Blistering:** The outer cover is lifting away from the reinforcement. This is often a sign of chemical incompatibility, where fluid has permeated the inner tube.²

Professional Business Procedures and Customer Liaison

For a specialist reseller, the "T-Strategy" (KDE - Kohones Development Exercise) is a framework for growing a professional reputation. This involves not just performing the repair, but building a relationship with the customer.⁵

The Client Service Call Procedure

A professional technician arrives on site presentable and polite. Before starting, they collect all necessary job details, including the machine number, site address, and contact name.⁵

1. **Site Greeting:** Introduce yourself and clarify the task.
2. **Site Induction:** many sites will require the technician to have a White or Blue card as well as carry any required site inductions.
3. **Safety Assessment :** Analyse the environment and lay out rags or spill kits.
4. **The Repair:** Complete the assembly according to the matched-system procedures.
5. **Testing:** Point out to the customer that the hose has been tested and positioned correctly to avoid future failure.⁵
6. **Payment and Documentation:** Account for all fittings and welding costs. Unless on an account, payment should be taken before leaving the site.⁵

Communication and Ethics

Effective communication is the lifeblood of a service business. This includes maintaining eye contact, professional posture, and a purposeful gait.

Physical appearance matters; first impressions often lead to lasting judgments about the quality of the work.⁵

Technicians must overcome physical, cultural, and organisational barriers to communicate clearly with machine operators.

This involves active listening—avoiding jumping to conclusions and taking concise notes of the customer's concerns.

In cases where a situation is beyond the technician's experience (e.g., complex valve bank issues), it is better to be honest and call for backup than to presume and cause a hazardous failure.⁵

Conclusion: Ensuring Continuous Compliance

The challenges faced by hydraulic resellers regarding insurance and compliance are entirely manageable through the rigorous application of professional standards.

By adopting the S.T.A.M.P.E.D. method, adhering to the "Matched System" principles of MDG41 and RS23, and maintaining a culture of safety and documentation, businesses can protect themselves from liability and ensure the safety of their clients.¹

The transition from a mere supplier to a "Specialist Reseller" requires an investment in training—such as the MEM20105 Certificate II in Engineering—and a commitment to using high-power, high-precision machinery like the P32.¹⁴

In the highly regulated Australian industrial sector, the ability to provide a traceable, pressure-tested, and perfectly matched hose assembly is not just a value-add; it is a fundamental requirement for survival and success.

Every technician must remember the core philosophy of "Safety First": if a hose is in doubt, it must be replaced; if a situation is unsure, backup must be sought; and every spill must be cleaned. Through these actions, we safeguard the health of the industry, the environment, and the workers who rely on the power of hydraulics every day.

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