Hose related sections of API RP 7L  
Proposed changes for 2nd Ed.  
draft 5 June 2018.

Item 5202 stated that: “API 7L hose sections need to be updated to accommodate the intended changes of hose sections of API Spec. 7K”.

The present draft includes the proposed changes in the Cement Hose, Drilling Mud Vibrator and Jumper Hose, and Rotary Hose section of API 7L. For the BOP handling systems minor corrections are proposed to match the wording of API 7K 6th Ed., namely “hydraulic hose” is used instead of “flexible hose” to distinguish from mud and cement hoses. A minor reference error was corrected “G.5.2.h)” instead of “G.5.2.g)”.

In the cement and mud hose section references to sections or tables in API 7K were deleted, in the meantime (since Addendum 2 of API 7L was published) 7K had two new editions, and these numbers changed.

In draft4 load requirements of safety clamps/chains were revised. Since the official values are the metric ones, they were rounded. A numerical mistake was corrected too. Increased load requirements were added for the new 7” and 8” size, 1.5 times of the requirement for the 5” and 6” hoses. We do not have a validated calculation method, but for bigger and heavier hoses stronger safety clamps, chains and slings seem to be logical.

The other changes are simply synchronization with the planned Addendum of API 7K.  
Draft 5 reflects comments by Robert Urbanowski (no other comments were received todraft4).  
Changes are indicated in red.

1 Scope

1.1 Objective

The objective of this publication is to provide owners and users of equipment listed below guidelines for inspection, maintenance, repair, and remanufacture procedures that may be utilized to maintain serviceability of the covered equipment.

This recommended practice covers the following drilling equipment:

a) rotary tables,
b) rotary bushings,
c) rotary slips,
d) high pressure mud and cement hose assemblies,
e) slush pump components,
f) draw works components,
g) spiders not capable of use as elevators,
h) manual tongs,
i) safety clamps not used as a hoisting device.

Add to 3.1 Terms and Definitions

Managed Pressure Drilling (MPD): an adaptive drilling process used to precisely control the annular pressure profile throughout the wellbore. The objectives are to ascertain the downhole pressure environment limits and to manage the annular hydraulic pressure profile accordingly. It is the intention
of MPD to avoid continuous influx of formation fluids to the surface. Any influx incidental to the operation will be safely contained using an appropriate process.

Underbalanced Drilling (UBD): a drilling activity employing appropriate equipment and controls where the pressure exerted in the wellbore is intentionally less than the pore pressure in any part of the exposed formations with the intention of bringing formation fluids to the surface.

Note: See API 92U

A well construction or maintenance activity employing appropriate equipment and controls where the pressure exerted in the wellbore is intentionally less than the pore pressure in any part of the exposed formations with the intention of bringing formation fluids to the surface.

Flexible Specification Level (FSL): a set of manufacturing requirements for rotary, vibrator, cement and jumper hose assemblies (see API 7K)

Add to 3.2 Acronyms and Abbreviations

MPD managed pressure drilling

UBD underbalanced drilling

Correct the definition of FSL to “flexible specification level” (present text: FSL flexible spec level)

Add to Bibliography:

API 92M, Managed Pressure Drilling Operations with Surface Back-pressure

API RP 92U, Underbalanced Drilling Operations

API Spec. 17J, Unbonded Flexible Pipe

API Spec. 17K, Bonded Flexible pipe
Annex A
(normative)

Recommended Practice for Operating Limits, Inspection, Care, and Use of Cement Hose Assemblies, Drilling Mud Vibrator and Jumper Hose Assemblies, and Rotary Hose Assemblies

This standard covers all types of high pressure mud and cement hose assemblies specified in API 7K. The definitions of terms of API 7K shall apply.

Cautionary note: high pressure mud and cement hoses specified in API 7K are intended to carry fluid only to the well bore. For hoses carrying fluid from the wellbore (return lines) at elevated pressure flexible lines in accordance with API RP 17B (API Spec. 17K or 17J) or API 16C should be applied.

A.1 Hose Length
A.1.1 Rotary Hose Length

In order to avoid kinking rotary hose, the length of hose and height of standpipe should be such that while raising or lowering the traveling equipment, the bending radius of the hose will not be less than the value of the minimum bending radius (MBR) specified by the manufacturer. The recommended length of rotary hose is derived by the following equation (see Figure A.1).

\[ L_H = \frac{L_T}{2} + \pi R + 2C + S \]  (A.1)

where

- \( L_H \) is the length of hose, m (ft);
- \( L_T \) is the length of hose travel, m (ft);
- \( R \) is the minimum radius of bending of hose as specified by manufacturer, m (ft).

NOTE If the MBR is not known then conservatively use MBR values stated in API 7K.

- \( C \) is the coupling length, m (ft);
- \( S \) is the 0.3-m (1-ft) allowance for hose length tolerance and contraction when internal pressure is applied (see API 7K).

Whenever it is necessary to operate with hoses that do not meet the optimum length requirements derived from the formula above, the user should select a hose that is longer than the optimum length. In these cases, the user should determine whether a longer hose could cause safety hazards by interfering with personnel on the drill floor. If such is the case, the user should make adjustments to either or both the height of the standpipe gooseneck and the hose termination on the traveling equipment, and repeat the calculations with the formula provided until the optimum hose length to be utilized is determined.
A.1.2 Changes to Hose Length as a Result of Pressurization

The overall length of hoses at atmospheric pressure will probably change as pressure is applied (see API 7K). The user shall ensure that sufficient hose length is provided between connection points to avoid overstressing the hose when it is under pressure.

A.2 Mud Standpipe Height

The recommended standpipe height is derived by calculation using the following equation (see Figure A.1).

\[ H_S = \frac{L_T}{2} + Z \]  

(A.2)

where

- \( H_S \) is the vertical height of standpipe, m (ft);
- \( L_T \) is the length of hose travel, m (ft);
- \( Z \) is the height, m (ft), from the top of the derrick floor to the end of hose at the swivel when the swivel is in its lowest drilling position.

NOTE When the actual length of hose is greater than the length calculated in A.2, the standpipe height should be increased by one-half the difference between the actual length and the calculated length.

A.3 Hose End Connections

API 7K specifies that hose end connections may be affixed to hose couplings with line pipe threads per API 5B for hose assemblies with a working pressure rating of 34.5 MPa (5000 psi) or less. For rotary hose assemblies with a working pressure greater than 34.5 MPa (5000 psi), no threads of any kind may be utilized to affix the end connections to the hose coupling. The user should be aware that in certain applications where there is considerably more hose movement during operation, such as on floating offshore rigs, cyclic bending stresses have caused fatigue failures at the last engaged thread between the end connection and the hose coupling when such threads are of the pressure-sealing type, such as line pipe threads specified by API 5B. Therefore, the user should consider alternatives to the use of line pipe threads to join the end connection to the hose coupling for these applications. As such, it is recommended that the user specify the end connection to be affixed to the hose coupling by butt-welding in the purchase agreement for any hose with a working pressure specified in API 7K. Alternatively, if the manufacturer can provide it, an “integral” hose coupling/end connection may be specified by the user in the purchase agreement. Such “integral” hose coupling/end connections are manufactured from a single piece of material. Hose assemblies installed onto the swivel gooseneck or top drive and onto the standpipe should be as nearly tangential as possible. The use of a standard connection on the swivel gooseneck (see API 8C) will ensure this relationship. The angle of the end of the standpipe gooseneck should be 15 degrees from the vertical and oriented toward the vertical line of travel of the hose connection point on the swivel.

A.4 Handling

In order to minimize the possibility of kinking the hose during crating or uncrating, the crate should be rotated as the hose is uncoiled out of or coiled back into the crate. Alternatively the lifting equipment should allow free rotation of the lifted end. When handling the hose on and off the drill floor, it should be kept as straight as possible and should not be handled with a sling hitched to the middle of the hose. The end connections of the hose should always be protected from damage due to sliding, abrading, or striking against objects. Special carriers may be devised to lift the hose from its mid-body to ensure that any bends induced in the hose while lifting and transporting are not less than the MBR specified by the
Whenever a hose has been removed from service and set aside for any reason, it should be protected from damage. Hose assemblies shall not be bent, straightened or uncoiled below their minimum operating temperature, because this can cause hidden structural damage.
Figure A.1—Layout for Rotary Hose

Key

- $C$: coupling length, m (ft)
- $H_b$: vertical height of standpipe, m (ft)
- $R$: minimum radius of bending of hose, m (ft)
- $L_T$: length of hose travel, m (ft)
- $Z$: height, m (ft), from the top of the derrick floor to the end of hose at the swivel when the swivel is in its lowest drilling position
A.5 Twisting

All hoses covered by this standard should not be intentionally twisted during installation, because each layer of reinforcement is fitted in an alternating right-hand and left-hand helical path around the hose for its entire length. Therefore, if the hose is twisted in one direction, one layer of reinforcement contracts while the other expands. Thereafter, for a hose that is twisted and subsequently subjected to pressure and/or bending, permanent damage to the hose will result that will affect its pressure integrity and shorten its useful life. Twisting rotary hose is sometimes employed to force the hose away from the traveling equipment or other interferences in the derrick to avoid contact, snagging, or abrasion. This practice should always be avoided. If the hose interferes with the derrick or mast structure or other objects, the standpipe should be repositioned to avoid these interferences.

NOTE Moving the standpipe may require a hose of a different length to be used per the formula in A.2.

Alternatively, the objects that the hose is coming into contact with should be repositioned. In cases where a flanged hose end connection is provided that requires the hose to be twisted to align the bolt holes, the other end of the hose should be fitted with an end connection that does not require a fixed or specific radial orientation in order to be mated, such as a hammer union. Alternatively, a swivel fitting can be installed in one or both hose attachments. To assist the user, each length of hose (except thermoplastic or armored hoses) has a longitudinal lay line of a different color than the hose cover. By line of sight down the length of the hose, this lay line should remain in view without forming a helical path after the hose is installed. This should be used as a guide in making certain the hose is installed without twisting.

A.6 Damage to the Outer Cover of the Hose

Rotary hoses should be installed to provide adequate clearance between potential interferences. In some cases, due to high winds or offshore rig motion, hoses may come in contact with interferences in the derrick. When this occurs, hoses should be inspected as soon as practicable for any damage to the outer cover. If the cover is damaged to the extent that the reinforcement materials of the hose are exposed to the elements, repairs should be carried out to the damaged area(s) to protect the reinforcing materials as soon as possible. This can be performed with epoxy or polyurethane resins, or other materials specified and approved by the hose manufacturer. If this is not done, moisture will enter into the reinforcement materials, and there are no existing means available to remove it. As a result, corrosion will occur to the reinforcement materials, which over time will progress to the point where the strength of the reinforcing materials will be reduced and the pressure integrity and useful life of the hose will be compromised.

A.7 Safety Clamps

The hose manufacturer is required to ensure that safety clamps specifically designed for the hose are available for purchase by the user, and to mark the hose body where such clamps are to be fitted in accordance with the requirements in API 7K. Safety clamps shall be designed to provide one or more attachment points that will allow the user to secure a length of chain or a wire rope sling to the safety clamp. Such attachment points shall incorporate a 28-mm (approximately 1\(\frac{1}{8}\)-in.) minimum diameter hole for attaching a safety chain or wire rope sling and will be so designed as to allow adequate clearance from the hose. The chain or wire rope sling, and the attachment hardware such as a shackle or connecting link, shall have a minimum breaking strength of 70,000 N (15,736 lb), or a working load limit of 14,000 N (3,147 lb) with a 5 to 1 safety factor for hoses up to 4-in. internal diameter. For hoses with 5-in. and 6-in. internal diameter, the minimum breaking strength shall be 140,000 N (3,1473 lb), or a working load limit of 28,000 N (6,295 lb) with a 5 to 1 safety factor. For hoses with 7-in. and 8-in. internal diameter, the minimum breaking strength shall be 210,000 N (47,210 lb), or a working load limit of 42,000 N (9,442 lb) with a 5 to 1 safety factor. The chain or wire rope sling shall be used to handle the ends of the hose and provide a means of restraining the end of the hose if the end fitting becomes...
The free end of the chain or wire rope sling shall be attached to a secure structure or object that is capable of withstanding the breaking force of the chain or wire rope sling and shall be of a sufficient length without restricting the movement of the hose. The user shall specify the proper safety clamps as specified above to be provided in the purchase agreement for the hose that is being supplied. The hose manufacturer shall include shipment of the proper safety clamp with each hose supplied, and any pertinent installation instructions. Safety clamps provided by the hose manufacturer shall be installed by the user on all rotary, vibrator, cement and jumper hoses at the locations marked on the hose body. The user shall verify that the safety clamp provided is of the proper size and is installed in accordance with the hose manufacturer's instructions as provided.

A.8 Vibration and Pulsation

Continuous pressure pulsations and vibration may shorten the useful life of rotary, vibrator, and jumper hoses used in high-pressure mud piping systems. Surge chambers or pulsation dampeners of the proper size should be installed in each mud pump discharge line to minimize pulsations and vibration in the high-pressure mud piping system and hoses. The precharge pressure for pulsation dampeners should be set per the dampener manufacturers recommendations. The suction piping to the pump should be pressure-charged or operated with a flooded suction to minimize cavitation of the drilling mud in the fluid end of the mud pump that can cause pressure pulsations. Pulsation dampeners designed for the pump suction piping should also be installed to minimize pulsation and cavitation. The user should also consider the installation of high frequency digital (versus analog) pressure monitoring instrumentation. If pressure pulsations are intentional or the corrective measures specified above have been installed but are ineffective in controlling the pressure pulsations to an acceptable level, the user should consider replacing the hose with one that has a higher flexible specification level (FSL 2 or FSL 3) as specified in API 7K. FSL 2 or FSL 3 hose assemblies are recommended for rotary, vibrator, and jumper hoses that are likely to incur high frequency pressure pulsations with an amplitude exceeding 6.9 MPa (1000 psi) during operation. Generally, unacceptable pressure pulsations are those that exceed 10 % of the designated standpipe pressure. The user should also consider the installation of digital (versus analog) pressure monitoring instrumentation, coupled with standpipe pressure data logging instrumentation to allow more accurate detection and recording of unacceptable pressure pulsation in the affected hose assemblies covered by this standard during drilling operations. The user is also cautioned that unacceptable pressure pulsations, combined with high operating pressures and/or temperatures (see A.9), and/or high flow rates (see A.10) and/or certain types of oil based drilling mud (see A.13 below) will most likely have a severe impact on the useful life of the hoses affected. High operating pressures in this regard are considered to be those that exceed 80 % of the rated working pressure of the hose.

A.9 Operating Temperature

Hose assembly operating temperatures should not be outside the designated temperature range specified by API 7K, or the manufacturer. Operating a hose outside its designated temperature range will shorten its useful life. The user shall specify the operating temperature range of the hose in the purchase agreement in accordance with the temperature range selections specified in API 7K when purchasing new hoses. If the anticipated operating temperature is above and/or below any of the temperature ranges specified in API 7K, the user shall consult with the hose manufacturer and reach an agreement on the operating temperature range of the hose to be specified in the purchase agreement.

Hose assemblies may be stored below their minimum operating temperature. Hose assemblies shall not be bent, straightened or uncoiled while below their minimum operating temperature, because this can cause hidden liner damage and unexpected failure.

A.10 Flow Rates and Abrasive Media

Flow rates through the hose assembly should not exceed the maximum flow rate specified by the hose manufacturer. Flow rates exceeding maximum values will shorten the useful life of hoses covered by this standard. In addition, abrasive conditions caused by sand or other solids in the mud can cause the
useful life of hoses covered by this standard to be shortened. The maximum flow rate for hoses may vary between different manufacturers for the same size and pressure rating. Because standpipe flow rates are increasing due to more demanding drilling conditions, additional mud pumps are being used to provide these higher flow rates. Therefore, it is important for the user to determine whether additional or larger diameter hoses are required to prevent exceeding maximum flow rates. In addition, the user should require the hose manufacturer to provide the maximum flow rate for each hose delivered under a purchase agreement.

A.11 Exposure to Pressurized Gases

A.11.1 General

When a rotary hose is exposed to gases under pressure for a prolonged period of time, gases will permeate through the liner. When this occurs, pressurized gas is trapped outside the liner and is not vented unless the hose is manufactured to meet gas service requirements. For rotary, vibrator, and jumper hoses that are likely to be used in air, gas, foam or mist drilling to convey pressurized air, gas, foam or mist; API 7K Flexible Specification Level 3 (FSL 3) or API 17B (API Spec. 17K or 17J) certified hose assemblies are recommended. If the hose is not designed for gas service and for any reason the hose is subsequently depressurized, the gas might not permeate back through the liner material at a sufficient rate to prevent collapse of the liner.

Whenever it is intended to use a high pressure hose assembly to carry fluid from the well bore (return lines) hoses made in accordance with API 17B (API Spec.17K or 17J) or API 16C should be used, instead of hoses made to meet API 7K.

A.11.2 Managed Pressure Drilling Operations

Return lines used in managed pressure drilling operations are likely to be exposed to well effluent, thus API 17B (API Spec.17K or 17J) hoses are recommended for this service.

A.11.3 Under-balance Operations

Under-balanced operations (UBOs) are defined as drilling activity employing appropriate equipment and controls where the pressure exerted in the wellbore is intentionally less than the pore pressure in any part of the exposed formations with the intention of bringing formation fluids to the surface. UBO shall not be construed to mean the same thing as air or gas drilling, or workover or well completion operations. Most UBOs are designed such that there are safeguards and redundancies provided to prevent the rotary hose from being exposed to well bore influx. When UBOs are designed in this manner, FSL 3 hoses made to API 7K can be used.

However, some UBOs are designed to allow exposure to well bore influx. The user is cautioned to use hose assemblies, designed for gas service according to API RP 17B (API Spec.17K or 17J).

A.11.4 Inspection of Rotary Hoses Exposed to Pressurized Gases

If FSL 1 or FSL 2 rotary hoses have been exposed to pressurized gases (inspite of the above recommendations), they should be inspected to determine whether the integrity of the liner has been breached or has collapsed. This can be accomplished with the use of a fiber-optic boroscope to visually examine the inner surface of the hose liner over the full length of the hose. The detection of bulges, blisters, punctures, or any other breach of the liner material shall be cause for rejection of the hose from further service.

A.12 Working Pressure
The working pressure for rotary, vibrator, and jumper mud hoses and cement hoses is published by the hose manufacturer and is specified in API 7K. The user is responsible to ensure that the working pressure of the hose is not exceeded while in service, including pressure surges and pulsations that occur in the system (see A.8).

A.13 Oil Base Mud

The use of oil base mud having an excessively high aromatic content will cause the hose inner liner to swell and shorten the useful life of the hose. It is recommended that oil base mud be held to a minimum aniline point of 66 °C (150 °F). If synthetic mud (e.g. ester-based mud) is used, then the compatibility of the hose liner material should be checked.

A.14 Barge-attended Offshore Rigs

For mud jumper hoses used between barges and offshore drilling rigs, care must be used so that alignment is maintained between both end connections. It is recommended that swivel joints be used at both ends. Operations in rough weather and high seas that induce bends in the hose that could violate the MBR of the hose, and/or high axial forces on the hose will shorten the useful life of jumper hoses in this application, which may cause a failure while in service.

A.15 Rotary Hose Field Pressure Testing

Field pressure testing of rotary hose, when required for establishing periodic safety levels of continued operation, should be conducted in accordance with the following guidelines.

A.15.1 Visual inspection should include examination of any external damage to the body, end structure, and couplings. Safety clamps should be checked for proper attachment to the hose, and safety clamp fasteners should be checked for damage, deterioration, and tightness. Safety chain or wire rope slings should be checked for damage or deterioration and that they are properly attached to structure capable of supporting the breaking strength of the safety chain or wire rope sling.

A.15.2 Hoses should be arranged as straight as possible, and twisting (see A.5) shall be avoided.

A.15.3 Prior to conducting pressure testing, the hose should be suspended in normal unstressed position from standpipe to swivel.

A.15.4 Rate of pressure rise should not be less than 6.9 MPa (1,000 psi) or greater than 68.9 MPa (10,000 psi) per minute.

A.15.5 All air in the hose shall be bled off prior to applying test pressure. When possible, water should be used as the test media.

A.15.6 The duration for holding the maximum test pressure in the hose should not exceed 10 minutes.

A.15.7 Field test pressure shall not exceed 1.25 times the maximum working pressure of the hose regardless of the test pressure that is specified by the hose manufacturer. Test pressures may also be limited to the maximum working pressure of the valves installed in the mud system that are used to isolate the hose for pressure testing based on the maximum pressure that can be exerted on the valve gates or seats as specified by the valve manufacturer.
A.15.8 The area adjacent to the hose to be tested shall be cleared of unnecessary personnel. Personnel assigned to conduct testing operations should wear appropriate personnel protective equipment, such as gloves, eye shields, or goggles, and be positioned out of harm's way in case there is an uncontrolled release of pressure.

A.15.9 A means shall be provided to release the pressure contained in the hose under controlled conditions after pressure testing is completed.

A.15.10 Hoses that are found to be leaking during the course of pressure testing should be removed from service and either repaired or destroyed and disposed of immediately after testing.

A.16 Hose Modifications in the Field

Attaching new couplings to used hose body materials is not recommended. Users considering the installation of new hose couplings onto a used hose body for the purpose of continuing to use it in high-pressure mud or cement service as defined in API 7K shall be aware that the pressure integrity of such a hose assembly may be compromised. In addition, the user shall be aware that, regardless of what markings may remain on the hose after re-coupling that would indicate its original compliance with API 7K, its fitness for purpose as originally certified will also most likely be compromised. It is recommended that if used hose is re-coupled by other than the original manufacturer, the original manufacturer's markings should be removed. This includes, but is not necessarily limited to, the practice of cutting a rotary hose into shorter lengths for the purpose of fabricating one or more vibrator or jumper hoses.

User Guidelines for Blowout Preventer Handling Systems

C.4.3

n) Hydraulic hose assemblies should be visually inspected at least annually, and as with all hoses, visual checks should be made prior to system operation for the following conditions. Hoses should be replaced in accordance with the guidelines specified in C.5.2 h)) when such conditions are discovered at the earliest opportunity.

— Damage or deterioration of the outer hose cover.

— Kinking of the hose body.

— Damage or deterioration of the hose end fittings.

o) Replacement of hydraulic hose assemblies is recommended to be performed at 5-year intervals. This interval may vary depending on visual inspection service conditions.

C.5 Determination of Design Load and Design Safety Factors for Non-purpose-built Systems

C.5.2

d) Hydraulic hoses used in piping systems shall comply with the guidelines provided in C.5.2h).

h) Hydraulic hoses shall be selected, fabricated, tested, cleaned, and installed in accordance with the following guidelines.

— The use of hydraulic hoses shall be kept to an absolute minimum required to compensate for vibration, thermal expansion and contraction, misalignment, or relative movement required between the hose end terminations.
— Hydraulic hoses shall have a working pressure equal to or exceeding the piping system into which they are installed. The minimum burst pressure of hydraulic hoses shall be a minimum of 4 times the working pressure of the hose as specified by the hose manufacturer.

— Only hydraulically crimped type hose end fittings shall be used. Swivel-type end fittings that are widely available are recommended to be installed at each end of the hose to prevent hose twisting during installation and removal. No galvanized end fittings shall be used, and no Teflon tape shall be applied to any pressure-sealing threaded connections, such as National Pipe Thread (NPT) threads.

— Raw hose body material used to fabricate hose assemblies shall not be older than 5 years from the date of manufacture and shall be suitable for and compatible with the type of media being conveyed.

— Paint should not be applied to the outside of hose assemblies at any time.

— All hose assemblies shall be internally cleaned to the extent necessary after pressure testing to ensure that any contamination inside the hose assembly will not adversely affect system operation. Hose assemblies shall be capped and sealed after testing and cleaning.

— When installing hose assemblies, they shall be routed and secured in such a manner that will avoid kinking or bends in the hose body that are less than the published MBR. Additional protection for the hose outer cover shall be provided in way of contact with surfaces subject to vibration.

— Each hose assembly shall be pressure tested to a minimum of 1.5 times the working pressure of the hose body prior to cleaning. Water should be used as the pressure testing media.

— When hose assemblies are fabricated by a qualified third party, the user shall request that the above requirements shall apply and that a certificate be issued for each hose assembly to verify that such hose assemblies comply with the above requirements with the test pressure specified on the certificate. Each certificate should have a unique certificate number.

— A list of all hose assemblies utilized in a system is recommended to be maintained by the user to allow prefabrication of hose assemblies for replacement. Such a list should specify, as a minimum, the hose manufacturer and part number, type and part number of the end fittings, overall length, and the working pressure of the hose assembly. If any hose assemblies are fabricated by a third party, the certificate number for each hose assembly should be included on this list.

C.9 System Installation Requirements

b) Selection, fabrication, cleaning, testing, and installation of hydraulic hose assemblies shall comply with the guidelines provided in C.5.2 h).