Quality Control – A Starting Place for post drilling operations and treatments

The specifics of quality control necessary to deliver good performance in any treatments depends upon the knowledge and understanding of the controlling factors for a job and the ability to check the items identified before the job, during the job and in some cases, after the job.

This list contains work of many industry specialists. It is a list of suggestions that could form a starting point, but check points will need to be added and/or removed to fit a job. Always involve knowledgable specialists in the specific technology and use local experienced field people as the first resource. Some errors may be found and applications are never uniform across the industry, thus absolutely no guarantees are made for accuracy or responsibility.

"QUALITY CONTROL IS WHAT YOU INSPECT, NOT WHAT YOU EXPECT....."

(author unknown)

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Acidizing

Workover Brief Specifications

____ workover objective clear?
____ are sour gas or other liquid, solid, fume or vapor precautions identified to meet safety and local regulations?

Job

____ pad, weather, access, and light adequate for job?
____ acid storage time in unlined steel tanks minimized?
____ acid type and strength as per procedure.
____ acid strength tested? Strength = _____%. Suggest that HF acid blends not be tested in the field.
____ acid volume on location is adequate for the job?
____ acid and additives suitable for formation?
____ inj rate and/ max pressure limits known and available to pumper?
____ correct amount and type of corrosion inhibitor added?
____ iron control additive used if designed?
____ mutual solvent and/or non-emulsifying agent?
____ antisludge additive used if needed?
____ other additives?
____ additives compatible?
____ preflush vol, type and procedure.
____ overflush vol, type and procedure.
____ tubing cleanout (pickle) procedure specified?
____ is acid heating required to control tubing contraction, paraffin, thermal fracturing or acid freezing?
____ load fluid recovery aid? (nitrogen, CO_2, swab, etc).
____ tool requirements (packers, spot valves, wash tools) met?
____ diverter type and method of removal known?
____ shut-in time minimized unless altered by design or well type?
____ environmental considerations, handling and disposal restrictions addressed?

Yard Inspection

____ does batch analysis of acid meet company specifications?

Examples:
Strength with 2% of call out strength.
HF content less than 100 ppm in HCl (limestone & limey sandstones)
Chlorinated hydrocarbon content less than 100 ppm.
SO_4 content less than 1500 ppm.
Sulfite (SO_3) content less than 100 ppm.
Total dissolved solids less than 15 ppm.
Total iron less than 100 ppm.

____ fluid compatibility check with formation fluids using live and spent acids with all the additives? Is compatibility test fluid representative of field?
____ MSDS sheets available for all additives?

_____ additives checked for compatibility?
_____ acid color is near "white" or clear. Yellow acid indicates iron.
_____ transfer lines clean?
_____ truck tank clean?
_____ acid strength measured?
_____ additives added (volumes checked by meter or calibrated measure).
_____ ion analysis of fresh water makeup for HCl/HF is compatible with HF.
_____ capability to circulate tank? Avoid hand held air lance. (Air rolling is permitted)
_____ additive batch numbers recorded if necessary?

Field Inspection

_____ acid tanks containing acid with inhibitor rolled continuously prior to injection?
_____ HCl acid strength measured.
_____ What is raw HCl acid color? (Yellow indicates iron.) Dark yellow or green/blue color may be a reason to test iron content of acid prior to use. If inhibitor is already in acid, a color test may not be possible.
_____ inhibitor present? (Inhibitor color is brown, additives may color acid.)
_____ no visible solids suspended in acid. (Filter if needed using polypropylene filter elements or DE with polish filter.)
_____ obtain copy of loading ticket - this ticket must be on truck to satisfy hazardous materials transport law.
_____ check size of ball sealers and compare to perforation size (balls should be larger than the largest possible perforation diameter.
_____ does ball sealers density match the design?
_____ check number of balls and schedule for dropping.
_____ correct type and volume mutual solvent?
_____ correct type and quantity iron control?
_____ lines clean and flushed?
_____ all job recording devices on location and working correctly?

Acid Treatment

_____ Safety meeting with responsibilities set out clearly.
_____ pressure behavior observed when acid reached formation?
_____ pressure response observed when diverter used?
_____ job surface injection pressure record obtained?

Backflow/Swab

_____ surface pressure recorded at specified times after shut-in?
_____ backflow samples taken if required for returned acid testing.

Equipment Inspections

Tank Inspection

_____ method to circulate tank.
_____ hatch covers available.
_____ tank clean to bare bottom.

____ tank can be strapped?
____ no deposits of rust or scale.

Pumps

____ seal materials compatible with acids and additives.
____ pressure and rate to satisfy job.
____ lines to circulate acid tank.

On-Site Inspection

____ Safety meeting with responsibilities set out clearly.
_____ acid strength titration or hydrometer check.
____ additives on location.
____ acid volume check.
____ flush volume check.
____ viscosity check to design specs with Fann VG meter.
____ compatibility check with wellbore, pre and post flush fluids?

Backflow Examination

____ pressure recordings, if needed for PTA or post frac analysis.
____ solids in backflow?
____ emulsions in backflow?
____ acid strength of backflow by titration (3 samples).
____ precipitates after standing? (May require lab analysis.)

Acid Fracturing

Workover Brief Specifications

_____ job objectives clear?
_____ acid strength
_____ acid volume
_____ acid corrosion inhibitor vol.
_____ acid diverter/fluid loss info.
_____ acid additives specified.
_____ additives given per acid volume?
_____ preflush volume and type.
_____ after flush volume and type.
_____ flush compatibility OK with acid and wellbore fluids?
_____ maximum injection rate and pressure.
_____ perf balls correct size for perfs? Correct ball specific gravity.

Backflow Information

_____ shut-in time (if any)
_____ max backflow rate
_____ initial choke size
_____ is a ball catcher required before the choke?
_____ final choke setting
_____ lowest rate before running pump.
_____ pH level before turning backflow to system.
_____ target viscosity specified for gelled acids?
_____ is breaker required?
_____ gelled acid break test?
_____ is acid friction reducer required?
_____ viscosity measured on Fann VG meter for all gelled acids?
_____ is a shear rate specified for all gelled acid viscosity measurements?
_____ environmental considerations, handling and disposal restrictions addressed?

Brines

_____ brine is clean and filtered to specification.
_____ record micron rating and beta rating of filter.
_____ if brine mixed on location, mixing procedures and order of mixing followed?
_____ equivalent circulating density calculated if viscosifier is to be used?
_____ viscosifier checked with field brine for gelling, speed of hydration and stability?
_____ brine density is correct?
_____ is a density temp correction needed for downhole?
_____ MSDS sheets available for brine additives?
_____ brine additives checked for compatibility?
_____ pH of brine recorded?
_____ compatibility of brine with additives checked against formation fluids?
_____ brine stored in covered tanks?
_____ analysis on brine provided by supplier (in file)?
_____ brine checked for compatibility with wellbore fluids?
_____ crystallization point of specific mixture is above all working temperatures (including sea floor) along tubulars?
_____ fluid loss control available if needed?
_____ corrosion inhibitor, bactericide and oxygen scavenger considered? Effect of temp on inhibitors?
_____ effect of brine/corrosion inhibitor on packer rubber?
_____ environmental considerations, handling and disposal restrictions addressed?

Casing Running

_____ Safety meeting with responsibilities set out clearly.
_____ casing fill-up schedule followed?
_____ max running speed per joint.
_____ monitor mud returns for proper casing displacement.
_____ check recommended torque and makeup procedure for couplings.
_____ joints Identified for stage tools.
_____ torque makeup control.
_____ centralizers positioned as designed.
_____ double float.
_____ float collar 2 - 3 joints above shoe.
_____ use thread lock on float/DV equipment (do not use thread lock on more than 1full stand).
_____ casing packers (if designed).
_____ standoff bands (if designed).
_____ seal rings (if designed).
_____ other equipment as designed.
_____ ability to rotate and reciprocate as designed.
_____ casing clean and debris free.

Mud Displacement

_____ pipe reciprocation.
_____ pipe rotation.
_____ max recip. speed to prevent press. surging.
_____ rotation 3 to 10 rpm. Torque limit?

Deviations less than 60^{o}

_____ Lowest YP and PV without dropping solids

Deviations greater than 60^{o}

_____ YP = 20 to 25

_____ spacer required? Type, volume?

_____ condition hole at rates up to cementing rates

_____ 95% of hole circulated by circulating caliper (grain, dye, etc)?

_____ volume and rate of returns verified?

_____ return fluid flow measurement operational?

_____ free fall prediction reviewed?

Mud Return Operations to Note

Spacer arrival and Mud Conditioning

_____ **color change?**

_____ **pH change?**

_____ **viscosity change?**

_____ **density change?**

_____ **Do not over displace. If plug has not bumped when displacement volume has been pumped, shut down the pump. Avoid a wet shoe by over displacing less than the volume of the pipe between the float and the shoe.**

_____ **check for flow back.**

_____ **open casing after bumping top plug.**

Cementing

Workover Brief Specifications

____ job objectives clear?
_____ maximum density to avoid fracturing.
_____ maximum pump pressure to prevent fracturing.
____ lost circulation zones identified from drilling.
_____ wellbore fluid density.
_____ density of mixed slurry.
_____ salt content of brines.
_____ bottom hole cementing temp.
____ maximum fluid loss (1000 psi) specified? (at a test temperature), or use following.
____ 20cc/30 min, prevention of gas channels.
____ 50cc/30 min, liner cementing.
____ 250cc/30 min, casing cementing.
____ 50 to 200cc/30 min, squeeze cement. Depends on experience and success in an area.
____ amount of Latex additive specified if a squeeze cement job?
____ min spaced flow rate for turbulence.
_____ min cement flow rate for turbulence.
____ Change spacers if plug flow is used.
_____ max flow rate for plug flow.
_____ salt content specified?
_____ anticipated mix water temp? Guidelines on max. or min. temp?
_____ silica flour specified temp > 230°F?
____ free water 1% or less?
_____ cement thickening time for BHCT and BHP.
Test duplicates field conditions.
____ field water used for lab tests?
_____ yield of slurry.
_____ gal mix water/sacks.
_____ total cement on site.
_____ total water on site.
_____ well head pressure during displacement.
_____ bottom hole pressure during displacement.
_____ mixing time.
_____ mud displacement volume.
_____ cement free fall rate.
_____ cum. vol. to catch top plug.
_____ cum. vol. to bump top plug.
____ compat. check of cement slurry with spacers and with mud.
____ environmental considerations, handling and disposal restrictions addressed?
____ onsite Q/C tools available? (pressurized balance or scales, if needed)

Cement Equipment - Yard Check

Check Cement Wiper Plugs

_____ **no debris in cavity of bottom plug(s). Plug color?**
_____ **bottom plug(s) diaphragm undamaged.**
_____ **top plug solid. Color?**
_____ **plug loading procedures clear and understood?**
_____ **plug holder can hold all plugs.**
_____ **can drop all plugs without opening.**
_____ **plug catcher operation OK.**
_____ **all tanks clean (NO leftover cement or foreign fluids). Open hatch to check interior for cleanliness.**
_____ **transfer lines clean.**
_____ **check all cementing head valves.**
_____ **If pipe must be rotated - check operation of rotating head.**
_____ **pump unit to include (for each pump), pressure gauge, a pump rate indicator and a cumulative barrel counter. All instruments must be accurate and operational. Tanks can be strapped.**
_____ **pressurized fluid balance required.**
_____ **chart recorder for pump pressure.**
_____ **water tight containers for dry and liquid samples.**
_____ **containers to hold slurry samples. All containers must be marked with proper identification.**
_____ **auxiliary lights to backup truck mounted lights.**
_____ **chart recorder for annulus pressure on squeeze jobs.**
_____ **density recorder on low pressure side?**
_____ **density recorder on high pressure side?**
_____ **additional working communications device for BP Rep.**

Bulk Cement Blending

<u>Bulk Plant Checks</u>

_____ **recent calibration of scales.**
_____ **verify weight calc.**
_____ **verify each additive identification.**
_____ **count additive sacks for each blend.**
_____ **do not allow partial bags of additives to be added over and above the design.**
_____ **sufficient additive mixing.**
_____ **sample the dry blended material from each batch.**
_____ **visually inspect each empty tank for cleanliness.**
_____ **test thickening time on each batch with water to be used on the job?**
_____ **estimate of pump time?**

Truck Checks and Loading

_____ **trucks must be empty prior to loading. Check tanks, surge cans and hoses.**
_____ **When loading lead and tail slurries, label the tanks as to contents.**
_____ **label samples with compartment information.**

Random Sampling Checks (when needed)

_____ **cement origin recorded? Same as lot tested for pumpability?**
_____ **cement sample (5 gallons or 20 kg) saved?**
_____ **cement additives (1 pint or 500cc) saved?**
_____ **sample mix water (5 gal in plastic container) saved?**

Well Location Reblending

_____ **remix dry blend.**
_____ **visually inspect empty tanks.**
_____ **collect 5 gal samples from each truck tank.**
_____ **measured volume of water on location before mixing.**
_____ **measured volume/weight of cement on location before mixing.**
_____ **volume or weight of additives on location before mixing.**

Pre-Job Communication

_____ **Review slurry and job design with service company representative.**
_____ **Safety meeting with responsibilities set out clearly.**
_____ **Sampling procedures implemented.**

Mixing Cement Slurry

_____ **control slurry density with pressurized balance. Mix as close as possible to designed density. Use pressurized balance every 5 minutes during mixing.**
_____ **paddle speed and cement addition rate OK.**
_____ **check calib. of all density devices. Density measuring equipment should be located downstream of pump.**
_____ **calib. meters vs tank strap and press gauges vs chart record.**
_____ **understand effects of free fall on surface pressure gauge.**

Log of Operations

_____ **record event times**
_____ **continuous density measurements.**
_____ **mixing or displacement rate.**

_____ mud return rate.
_____ wellhead pressure.
_____ operation in progress.
_____ cum. vol. pumped.
_____ pump speed (spm).
_____ properly operating pressure recorder.

Top and Bottom Wiper Plugs

_____ inspect hollow core on bottom plug.
_____ hollow opening is clear.
_____ no extra rubber or trash below diaphragm.
_____ diaphragm is undamaged.
_____ check sequence of plug loading.
_____ bottom plug red or yellow and is hollow with a diaphragm.
_____ top plug is black and solid.
_____ bottom plug will be first plug dropped.
_____ plug head operation check. Valves, drop pin retainer and by-pass are operational.
_____ pump spacers ahead of bottom plug.
_____ batch mix if possible.
_____ recirculating mixers if mixed on-the-fly.
_____ save a sample of mix water (5 gal).
_____ cease mixing at first sign of air or sharp density drop.

Material balance at end of job.
_____ volume of cement on location after job.
_____ volume of water on location after job.
_____ volume or weight of additives on location after job.

Chemical Treating (Non Acid)

Workover Brief Specifications

_____ **job objectives clear?**
_____ **safety considerations for each chemical known and understood?**
_____ **do any have exposure limits? (vapor, skin contact, etc.)**
_____ **chemical types and volumes.**
_____ **chemical purity or rejection point specified? (How to tell if this is the chemical that was ordered.)**
_____ **injection pressure maximums.**
_____ **soak time/circulation rate.**
_____ **diverting method (if used)?**
_____ **effect of solvent on service company equipment (fluorocarbon or better seals are usually needed).**
_____ **backflow procedures.**
_____ **byproduct control (if needed).**
_____ **environmental considerations, handling and disposal restrictions addressed?**

Solvent Treating

_____ **clear reason for running solvent?**
_____ **well equipment and pump equipment seals stable to solvents?**
_____ **safety meeting with responsibilities set out clearly.**
_____ **environmental considerations, handling and disposal restrictions addressed?**
_____ **spill prevention and reaction issues addressed?**
_____ **^{o}F flash point for solvent?**
_____ **flash point meets requirements for area?**
_____ **MSDS information available?**
_____ **safety equipment for handling?**
_____ **compatibility tests with well fluids?**
_____ **solvent type/vol for paraffin removal.**
_____ **solvent type/vol for asphaltene removal.**
_____ **solvent type/vol for scale removal.**
_____ **solvent type/vol for oil base mud removal.**
_____ **method for solvent identification (boiling point, analysis, other).**
_____ **spotting procedure to control density segregation. (Most oil solvents are 7 lb/gal or 0.84g/cc or 0.36 psi/ft.)**
_____ **field test of solvent on damage (if possible).**

Chrome Pipe Handling (data from John Martin, John Alkire, Khalefa Esaklul, Steve Groves and others)

Transport

1. **Chrome tubing should be transported on custom racks to minimize movement and impact during transport.**
2. **All tubing joints should be separated by non-metallic dividers. The dividers should preferably be non absorbent (not wood)**
3. **Non metallic slings should be used for handling the tubing. Steel slings with non metallic straps that wrap around tubing may be used.**
4. **Tubing loading and unloading should be witnessed and controlled by a designated person.**

Inspection and Preparation

1. **Rack tubing on the pipe deck one row at a time, ensuring that the joints do not come in contact with each other or steel supports. Use non-metallic slings for handling.**
2. **Remove the thread protectors using wooden or plastic mallets. Remove all desiccant packages. Drift all joints using a non-metallic drift from box to pin. Use driftable protectors if available**
3. **Avoid hammering or impacts at all costs. The hardness of Chrome tubing is strictly controlled; impacts to the pipe can cause localized hard spots which can be starting points for sulfide stress corrosion cracking.**
4. **Blow through the pipe with compressed air to clear away moisture and loose debris.**
5. **Clean both threads and thread protectors with a safe, clean solvent (do not use diesel or other paraffin containing material) and allow threads to dry.**
6. **Use a nylon bristle brush to clean the threads if needed (do not use wire brushes as wire can remove non-galling and anti-corrosion coatings).**
7. **Visually inspect pipe body, thread, thread coating and the seal area for any signs of damage. Repair of minor pipe body damage may be attempted in the field using approved repair methods. Thread and seal damage is cause for rejection of the joint. Red-band the rejected joint and mark the reason for rejection directly on the joint with non-washable marker or paint.**
8. **Mark the start of the threads on the box and pin ends with a precise mark a few inches long along the pipe body.**
9. **If the pipe is no to be run immediately, lightly coat the threads of both pin and box with an approved material (from pipe manufacturer or supplier). Use a light coating of an API thread dope if no supplier's recommendation exists. Use of a thread dope prevents further inspection of the threads, so a detailed inspection must be done prior to coating.**

Running Pipe

SPE 26754: Harris, D., Jaensch, M.: “Recent Advances in the Handling, Makeup, and Running of CRA Tubulars,” SPE 26754, Offshore European Conf., Aberdeen, 7-10 September 1993.

1. Check all running equipment. Pay particular attention to the condition of all tong dies. Scratches to the pipe body of Chrome tubing promotes stress corrosion. Dies specially designed for Chrome tubulars should be used. (In some areas, the "non-marking" dies for the power tongs have been used, but they didn't grip properly. In these cases, regular dies (very low profile gripping teeth) that covers most of the circumference of the pipe were used. This substitution would need o be on a case by case basis.)
2. Provide an impact absorbing covering or matting on the catwalk (rubber, wood, fiber, etc., have been used) to provide cushion and separation between the Chrome tubular and the steel panels.
3. Carefully lift the joints to the cat walk, preferably one at a time or a small group of bundled joints. Avoid impacts of any kind.
4. Avoid dragging the tubing joints if possible. Avoid dragging over steel at all costs.
5. All thread protectors must be in place while moving.
6. Using a single joint elevator, raise the joint to stab. Dope according to manufacturer’s or supplier’s specification of the joint being used. Use pipe dope sparingly. In absence of supplier’s specification, concentrate dope on the pin and cover very lightly.
7. Always use a stabbing guide. Ensure guide is the correct size for the tubing and joint design. The guide should cover the upper box shoulder.
8. With a person on the stabbing board, stab slowly and vertically, ensuring that the box and pin thread start paint marks are lined up. Vertical alignment during stabbing and the entire makeup operation is critical. Do not rock the pipe.
9. Make the first 4 or 5 turns by hand using a strap wrench. This ensures proper alignment of the threads.
10. Apply backup tongs, then using power tongs equipped with a torque limiting system (e.g., dump valve), make up joints at low speed (5 rpm).
11. Ensure that pickup elevators are snug against the lifting shoulders when picking up. Set the slips only after the pipe has stopped moving. Slowly adjust the slips to take the weight of the string.
12. API modified thread dope (which conforms to API Bulletin 5C2) with a friction factor = 1, should be used in the absence of a recommended dope. Do not use contaminated dope of any type. Stir the thread dope before use and protect from contamination during use.
13. From case histories, the running speed of chrome tubulars is about 6 to 10 joints per hour (for a dual, five joints per string per hour).

Pulling Pipe

1. **The tubing joint make-up analyzer and speed regulator should always be used when backing out the connection.**
2. **The joint should not be in tension when backing out, resulting in impact damage: this can cause a rapid jump-out resulting in impact damage. The joint will drop slightly when the thread is fully backed out. Do not rotate more than ¼ turn past this point or thread galling may result. The pipe should be backed out slowly, initial breakout at 1 to 2 rpm and increasing to makeup rpm, before slowing as the disengagement point is reached.**
3. **Guide the pin out of the box by hand and lift clear. Visual inspection of the breakout and threads is recommended for the first 20 joints and then at a lesser frequency.**
4. **Replace the thread protectors before laying the pipe down or racking stands. Coat the threads or the protectors before installing the connectors.**
5. **The tubing should be cleaned as soon as possible after pulling from the well and before the stands are covered by other pipe. This is particularly important when pulling pipe from a corrosive environment. When using oil based mud, it should be wiped as it comes out of the hole.**

Storage

1. **Thoroughly rinse used pipe internally and externally with fresh water to remove brine packer and completion fluids within 24 hours of removal from well.**
2. **Store Chrome pipe inside or under cover as far away from the sea front as possible (avoid salt sprays). Rack tubulars a minimum of 18-in. above ground.**
3. **Rest on non-metallic supports, preferably of non absorbing design (not wood).**
4. **Do not mix any type of corrosion resistant pipe with carbon steel pipe.**
5. **Do not mix weights, grades or sizes of pipe.**
6. **Never use metal thread protectors. Use closed-end thread protectors with grease, preferably inhibited, if or when pipe is internally dry.**
7. **If tubulars are wet or if closed-end thread protectors are unavailable, chock one end of the pipe rack a minimum of 8-in. to provide at least a two pct. slope for internal drainage.**
8. **Use of gel-type desiccants for internal drying is not recommended.**
9. **Apply storage compound as pipe comes into the storage facility. Mark date lot was protected. Use regular inspection to provide needed re-treatment frequency.**
10. **Inspect periodically (10% of the pipe, including threads, every 6 months) and identify and remove bad joints. Mark joint with specific**

defect and remove from the storage rack. Re-coat with protective compounds based on local conditions and needs rather than a world-wide edict.

11. **Inspect the integrity of mill-applied external varnish on new tubulars. Use an atmospheric corrosion inhibitor coating* if in poor condition or if corrosion is visibly evident.**
12. **For temporary storage of used pipe, spray the OD with an atmospheric corrosion inhibitor coating*, inspect periodically and re-apply as necessary.**
13. **For extended storage of used pipe, sand blast or wire brush OD clean, rinse, dry, and apply a varnish-type coating.**

***NOTE: Based on work by L. C. Sumbry and M. E. Climer on inhibitor coatings for sucker rod storage, we recommend use of solvent-base (naptha or aromatics) petroleum wax type coatings. Examples include: Rustron Q-20 (Champion Chemicals/Houston, TX), Rust Veto 345 (E. F. Houghton/Valley Forge, PA), Tretolite Kontrol KP-94 (Petrolite Co., Houston, TX), and SOR 344 (Mayco Oil Co./Warminster, PA).**
Note that in-house tests have been performed only on steel coupons and effectiveness on 13Cr materials is unknown.

Coiled Tubing

Inspection

_____ **inspect bridges, roads, overhead lines and locations to identify height or wt. Problems**
_____ **check location (or platform) for space to operate safety and minimize overhead crane movements over coil.**
_____ **locate underground lines or cables before setting anchors.**
_____ **model job to depth and pump rates and pressures to determine if coil mechanical safety is met.**

CT BOP and Well Control

_____ **set BOP's w/ blinds, cutoffs, kill/return spool, slip rams and blinds (bottom).**
_____ **have BOP's been fully tested? (not just function test)**
_____ **is BOP rated to cut tubing under maximum possible wellhead pressure?**
_____ **on hazardous workovers, are the riser and BOP NACE certified?**
_____ **use double blind/shears on top if using comby rams.**
_____ **use annular preventer if using BHA different size than coil.**
_____ **if perforating on live well, an annular diverter may be needed to seal around new guns.**
_____ **if fluid will circulated, or acid is to be backflowed/jetted mount a Tee below the BOP stack. The Tee should be equipped with an isolation valve and rated to NACE standards and press. rated for expected surface pressure.**
_____ **install added set of manual rams (minimum pipe/slip) below flow Tee.**
_____ **rerun/choke line and kill line should be equipped with two full opening valves and a choke manifold (or similar device) rated to the same or higher pressure rating than the ram preventers.**
_____ **where surface pressures above 3000 psi are possible, use a flow cross instead of a Tee and develop both sides with choke and flow lines.**
_____ **choke replacement parts on hand?**

Pre Job

_____ **safety meeting held and roles/responsibilities defined?**
_____ **identify crane operator/coordinator match up?**
_____ **identify conditions when jobs should be shut down and who should shut it down.**
_____ **personnel warned to stay out of crane boom area.**
_____ **establish evacuation routes, meeting areas and responsibilities**
_____ **pressure test coil to max job pressure**

_____ support legs or base suitable for unit and stack?
_____ stake down return lines / avoid area during backflow
_____ avoid equip. placement that blocks evacuation route.
_____ chain injector head should be stabilized with a minimum of three chains or four legs.
_____ pickle tubing and flush with water/nitrogen.

CT Job

_____ paint or mark tubing with a permanent depth flag about 300 ft from free end of tubing.
_____ running speeds not to exceed 100 ft/minute until the first trip is made.
_____
_____ at end of job, flush coil and leave nitrogen charged if CT to be stored.

CT Transport Problem Suggestions

Coiled Tubing units are heavy and tall. Transport to the job site requires inspection of routes that can accept the CT weights and heights. The following, adapted from Alex Sas-Jaworsky's, publications in <u>World Oil</u> is a good starting point for inspections.

<u>Onshore</u>
Route inspection for height and weight limits.
Unit placement at site.
Crane height, lift weight, angle and swing limits.
Buried line and cable location identity.
Hazard potential for site (wind, water, gas, etc.)

<u>Offshore</u>
Platform desk space and load constraints
CT unit placement
Crane weight limits and reach
Class 1, Division 1 and 2 hazard area (API 500B) MMSINC G-239 and G-231.
Hazard potential for site (wind, water, gas, etc.)

Drill Stem Tests

Workover Brief Specifications

_____ **job objectives clear? Wellbore sketch? Safety considerations? Max. press?**
_____ **H_2S contingency plans if H_2S present?**
_____ **hole/casing problems? Cement squeeze/equip in well?**
_____ **type of tests? (1) oil zone, (2) gas zone, (3) injectivity test, (4) log-inject log, (5) frac.**
_____ **type of test string to be run? - (1) size, (2) retrievable packer and downhole test tools, (3) permanent packer and no downhole test tools, (4) permanent packer and downhole test tools, (5) surface readout required?, (6) mud line safety valve?**
_____ **considerations for H_2S, CO_2, temp, pressures, valves, safety joint.**
_____ **sketch of test string showing all components with I.D. and O.D. of each part, length, type connections and x-overs.**
_____ **reasons why each test tool is being run. (Don't copy old programs.)**
_____ **how will the well be perforated? Backup detonating system?**
_____ **if well is to be perforated underbalanced, how much underbalance? What type of cushion?**
_____ **hydrostatic requirements given if BHP unknown?**
_____ **number of tests to be conducted? Expected time frame for each test.**
_____ **if testing below 12,000 ft or for gas, serious consideration should be given to having a special test string. (Not the drillpipe used to drill the well.) This string must be thoroughly cleaned before use. Metal to metal seals/threads are necessary.**
_____ **weight required to set the test packer? How much is available in the test string? Are correct rubbers on packer for expected conditions, (temp, oil base mud, etc.). RA pip tag for packer location by gamma ray?**
_____ **enough slip joints in test string to allow for expansion and contraction effects? How many open and closed?**
_____ **expected BHP and BHT.**
_____ **time clock spec. (72, 120 hrs, etc.).**
_____ **gauge type spec. Accuracy? Resolution? Backups?**
_____ **downhole shutoff needed for PBA?**
_____ **have dimensions of BOP stack been checked with dimensions of sub-surface test tree (SSTT) to ensure pipe rams will close on slick joint? Possible to close shear rams after disconnecting from SSTT?**
_____ **does the BOP stack have set of pipe rams same size as test string?**
_____ **is a lubricator valve installed below rig floor to minimize amount of lubricator on top of surface tree. Top connection match to lubricator?**
_____ **sufficient fittings for downhole and surface piping?**

_____ are slings of sufficient length and rating to hold weight of test strings if needed? Are slings of equal length and will pad eyes fit in elevators?

_____ how will test string and surface equipment be press tested. To what pressure?

_____ separate air supply for burners to ensure rig air not overloaded? Uninterruptible air supply for controls?

_____ flare line set? Adjustments for wind?

_____ what fluid in test string?

_____ is surface readout equipment available for downhole press/temp measurements? Different wireline/lubricator required than was used to perf well?

_____ H_2S resistant wireline/equip. needed?

_____ if bottom hole samples are to be taken, have all necessary mercury handling regulations/procedures been satisfied?

_____ if permanent packer run without downhole test tools, is swivel available with a large enough I.D. to allow shifting tool for sliding sleeve?

_____ contingency plans for stimulations?

_____ contingency plans for oil spill?

_____ how will well be killed after each test is complete?

_____ how will previous test interval be isolated from zone to be tested next?

_____ if tubing conveyed guns are to be used and wire line work is desired across perfs, then spent guns will need to be dropped off in rat hole previously drilled to accommodate them.

Job Preliminaries

_____ what has the weather trend been in previous years for the test period? How much down time can be expected? Have extra weather forecasts been ordered for test period?

_____ are necessary sampling containers available?

_____ has consideration been given to problem of heat from burner if high flow rates are expected? Wind direction? Water pump (rig) capacity for oil burner water shield 1.25 times oil flow rate.

_____ have flare permits been obtained.

_____ consideration of freezing problems? (glycol)

_____ procedures for emergency shut in, line leaks, etc.

_____ limits set on when to shut in? What to do next?

_____ safety guidelines prepared stating whether well will be perforated at night, flow periods started only in daylight, etc.?

_____ adequate lighting for night operation?

_____ necessary equipment available to isolate zones, including cement equip. and drill pipe or wireline to run plugs?

_____ fishing tools for all the test equipment readily available? Wireline/slickline on standby?

_____ in-line sand traps needed?
_____ hold down equip. adequate?
_____ equip. cert. for zone 1 operations? Flame arresters on engines?
_____ all meters/gauges calibrated before arrival?

Field Tests

_____ pretest all surface equipment and cement pump on deck.
_____ pretest downhole tools when possible.
_____ check press rating of "chick-sans."
_____ are hammer-on union pressure ratings consistant?
_____ is surface piping arranged so that it is possible to flow to: (a) gauge tank, (b) heater, (c) separator, or (d) directly to either burner?
_____ drift all strings.
_____ safety meeting.

Electric Line

Filtration

Workover Brief Specifications

_____ does filtering system have adequate capacity for rate and pressure?
_____ all surface lines/hoses flushed?
_____ tanks really clean?
_____ filtration needed?
_____ DE or Cartridge?
_____ max rate specified?
_____ environmental considerations, handling and disposal restrictions addressed?

DE Filtration

_____ is DE press large enough to filter fluid at the required rate?
_____ enough DE material on location?
_____ filter bed addition possible?
_____ 2 micron (or less), beta = 1000, guard filter down-stream?
_____ can DE be backflushed with water and purged with air.

<u>Cartridge Filtration</u>

_____ job objectives clear?
_____ housing rated for location pressure?
_____ flow diverter in housing?
_____ valve at bottom of dirty fluid chamber?
_____ must be possible to measure press differential?
_____ cartridge micron rating at beta = 1000? (Unless otherwise specified in brief.)
_____ correct cartridge for the job (polypropylene for filtering acid. Do not use resin coated cartridges)
_____ number of these cartridges on location? (Are there enough cartridges to do the job?)
_____ cartridges fit housing (dia. & length)?
_____ changeable without shutting down?
_____ 50 psi press. minimum to filter inlet?

<u>Cartridge Changeout</u>

_____ change at 35 psi max. differential.
_____ pressure bled off?
_____ dirty fluid drained?
_____ REPLACE ALL ELEMENTS.
_____ elements sealed?
_____ gaskets in place?

____ air bled off as pressure slowly applied?

<u>Filter Condition</u>

_____ visibly dirty?
_____ crushed?
_____ outer body broken at any place?

Fracturing (Proppant)

Workover Brief Specification

_____ job objectives clear?
_____ working headset to the company man for all jobs. This must be worked out with the service company in advance.
_____ prepad/pad/minifrac volumes specified in units to be used by the frac van.
_____ frac fluid total volumes specified. Make sure that the design volumes on location are usable volumes at the design pump rates. Sufficient tank reserves included to avoid losing pump prime.
_____ additive compatibility at weather conditions considered?
_____ total proppant specified.
_____ proppant meets quality specifications?
_____ size proppant specified.
_____ type proppant specified (Brady, Ottawa, ISP, bauxite, etc.)
_____ pumping/loading/ramping schedule clear and understandable.
_____ minimum pump capacity (HHP) specified.
_____ all additives and method of addition specified.
_____ rheology testing outlined for both lab and field? All tests must use representative fluids with samples for lots to used for the job.
_____ break time at temperature known?
_____ will field sample be collected for break time test?
_____ gelled fluids compatible with wellbore fluids?
_____ crosslinker type specified?
_____ extra crosslinker on location? (Job must be shut down when crosslinker supply is gone).
_____ breaker incorporated in design.
_____ method for monitoring breaker addition is included.
_____ pH of base gel before crosslinking.
_____ pH of completed frac fluid.
_____ tubular pressure limit specified.
_____ clean string or use work string.
_____ tree saver?
_____ maximum annulus pressure specified?
_____ water tight sample containers specified?
_____ plan for what to do if one pump goes down. What to do if blender goes down?
_____ type of resin coated sand specified?
_____ % resin on sand specified? What to do if a sand conveyor goes down?
_____ contingency on screen-out discussed?

Pre-Frac (Field and Yard) Inspection

_____ densometers in line on each blender and working correctly?
_____ when was last time densometers were calibrated?
_____ pump rate/vol verified with tank readings?
_____ tanks clean (visually inspected to bottom). Bactericide added before filling tanks.
_____ no broken or partial additive bags.
_____ proppant hauling tanks clean by visual inspection.
_____ proppant size check.
_____ check frac fluid break time with water bath.
_____ unions/connections compatible.
_____ water source is as specified.

Field Inspection

_____ sufficient usable additives and fluid volumes on location to do job?
mix frac fluid with water/oil to be used on the job.
_____ record viscosity of gel. Does it meet minimum viscosity based on lb/1000 gal. as measured in lab?
_____ record pH and visual description (ropy, smooth, colors, fisheyes, etc.)
_____ save 1 pint or 500 cc frac fluid sample without breaker for comparison.
_____ save 1 pint or 500 cc frac fluid sample with breaker for comparison.
_____ safety meeting with responsibilities set out clearly.
_____ headset working?
_____ supply valves operating and not leaking.
_____ proppant transfer equip. operation is operational and clean.
_____ proppant transfer machinery calibrated (copy to file).
_____ estimate quantities of all additives/fluids/proppant on location.
_____ same additive batch #'s used in lab?
_____ copy of loading ticket.
_____ service company has copy of MSDS sheets in their file on location for each chemical.
_____ field sieve analysis of proppant OK?
_____ flow rate meters calibrated and working.
_____ additive addition devices working and accurate?
_____ all instrumentation functional.
_____ all valves and pop-offs installed.
_____ use "Y" type frac head rather than a "T" head to minimize proppant damage.
_____ if a computer ramping blender is used, do trial model run to check closeness with design.
_____ flush all lines and pumps.
_____ surface lines pressure tested to maximum allowable pressure plus a safety factor.

Frac Fluids

_____ all water clean and from source specified in the brief.
_____ is a water heater required to prevent tubing/packer movement?
_____ bactericide added (must be maintained in polymer solutions in warm weather).
_____ filtered?
_____ mix a sample of all polymer fluids prior to start of job.
_____ any condensates and oils to be used are clean (filtered just before use), unweathered and same as used in testing.
_____ mix a sample of gelled oil fluid if used.
_____ keep a 500 cc or 1 pint frac fluid sample without breaker.
_____ keep a 500 cc or 1 pint frac fluid sample with breaker.
_____ breaker and crosslinker schedules on location? Check delay x-linking.

Proppant

_____ proppant meets acceptable ranges for size and cleanliness.
_____ proppant sample collected. Collect multiple samples from the belt or proppant handling system and combine into a single sample for each individual proppant size.
_____ proppant bins identified for size, type and coating.

Fracturing Operations

_____ dilute breakers in liquid form and meter into frac fluid on-the-fly.
_____ monitor breaker addition on recording chart.
_____ when well is on strong vacuum, cut flush short in order to leave perfs covered with sand.
_____ when pumping resin coated sand tail-in where wells go on vacuum, include activator in flush water to insure resin bonding.
_____ monitor premixed frac gels for pH and viscosity (bacteria control is critical in warm weather).
_____ monitor cross-link times in oil gels.
_____ popoffs installed and braidenhead open?
_____ tree saver installed.
_____ annulus pressured.
_____ pressure test all equipment.
_____ standby blender hooked in and ready.
_____ save samples of on-the-fly mixed gels.

After the Frac

_____ collect shut-in information as specified.
_____ check proppant/additive storage to get true volumes used.

_____ inventory (strap) and record volumes in all tanks.
_____ follow backflow procedure.
_____ samples collected from backflow.

Gravel Packing

Workover Brief Specifications

_____ job objectives clear?
_____ wellbore sketch with all equipment and dimensions?
_____ gravel size specified
_____ gravel volumes spec.
_____ gravel type (ceramic, resin coat, etc)
_____ preflush fluid specifications.
_____ main packing fluid spec.
_____ acidizing/acid prepack design?
_____ packer type spec.
_____ wash pipe OD/ID specified?
_____ screen OD, ID, gauge opening spec.
_____ flush joint liners used in narrow (<1.5" clearance) holes?
_____ clean blank pipe same OD as screen.
_____ shear joint in design?
_____ centralizer spacing OK?
_____ filtration requirements spec.
_____ understandable procedure?
___ environmental considerations, handling and disposal restrictions addressed?

Equipment Inspect.

_____ wash pipe press test OK? (copy to file)
_____ crossover inspection certification to file? (check threads, body, cleanliness)
_____ no additional valves below the control head.
_____ control head and lines pressure checked to 2000 psi with an external tester.
_____ wash pipe OD.
_____ screen undamaged?
_____ slots free of debris, scale, rust?
_____ screen gauge check (+0.001/-0.002")
_____ seal assembly OK?
_____ gravel fines test OK? (<1-1/2%)
_____ gravel roundness OK?
_____ more gravel available than specified?
_____ gravel type is correct?
_____ packer operation OK?
_____ packer clean/unpainted?
_____ all valves on control head open before TCP.
_____ pill material available if needed to control excessive fluid loss.
_____ mule shoe on well screen if fill expected.

_____ jars above GP assembly.

Fluid Tests

_____ well circulation fluid clean after pickle?
_____ gravel fall rate of 1/8" (or less) in 5 min?
_____ base carrier fluid clean.
_____ gelled fluid sheared and filtered (10 micron at beta = 100).
_____ ungelled fluids filtered to 2 micron or less (beta = 1000).
_____ field viscosity check?
_____ chemical additives as scheduled.

Samples (if called for)

_____ base fluid sample (1 quart).
_____ dry polymer sample (1/4 lb).
_____ other chemicals in fluid (50 cc each).
_____ gravel (1 quart).
_____ gelled fluid (1 quart).

Gravel Packing Operations

_____ Safety meeting with responsibilities set out clearly.
_____ makeup gravel pack assembly.
_____ drift all screens, nipples and blank pipe with Teflon rabbit
_____ pipe clean inside and outside.
_____ use pipe dope sparingly - dope pins only, not boxes. Wipe off excess dope from outside of joint.
_____ locate sump packer.
_____ record pickup and slackoff weight prior to stinging into sump packer.
_____ test circulating positions when using multi-position packer and mark locations on string.
_____ establish circulation in lower position, mark pipe, and record pressure to break circulation.
_____ locate reverse position, mark pipe 5 ft above rotary table.
_____ break circulation and note free returns.
_____ pickle the screen assembly. Use soak or slow circulation.
_____ injection tests prior to gravel mix.

Logging - Open Hole/Cased Hole

Workover Brief

_____ **job objectives clear? Wellbore schematic?**
_____ **purpose specified for each log?**
_____ **type/size of tools and logs to be run.**
_____ **wellbore fluid compatible with the logs?**
_____ **size of tools OK for hole? Is hole OK?**
_____ **intervals specified for each log. Can the deepest depth to be logged be reached with the highest sensor on the string?**
_____ **original KB measurement known and referenced to log depths?**
_____ **order in which logs to be run?**
_____ **indicate possible log scales.**
_____ **lithology settings for FDC-CNL?**
_____ **identify correlation log if used.**
_____ **approximate BHT referenced?**
_____ **tool temp/press limits? (max temp for tools at least 20oF above estimated BHT?)**
_____ **offset log available for reference.**
_____ **wellhead pressure referenced/pressure control equipment required. Specify type and pressure rating.**
_____ **is well sour or sweet?**
_____ **define logging speed.**

Log Heading Information

_____ **Well name, company and location**
_____ **API number**
_____ **date of log**
_____ **log interval, casing data, KB reference.**
_____ **allowable error constants for each type equip.**
_____ **mud or fluid type in wellbore and surface circulating mud temperature.**
_____ **bottom hole temperature**
_____ **truck number, service company personnel and service company yard location.**
_____ **elapsed time for each run.**
_____ **bit sizes and changes.**
_____ **log column identification and units.**
_____ **service company log equipment type and serial number.**
_____ **scale and scale changes.**
_____ **deviation through logged zone.**

Operation

_____ **record both shop and field calibration values of tools on logs.**
_____ **tool sketch? (OD's, length)**
_____ **line condition/size/max pull?**

_____ **date line last marked?**
_____ **date of last reheading and service after heading?**
_____ **cable log book checked?**
_____ **record location and number of any splices on cable section in well.**
_____ **caliper check in the surface pipe.**
_____ **log reading check in "standard zone"?**
_____ **collect freshly circulated mud sample for resistivity measurement.**
_____ **run filtration test on mud sample and record filtrate resistivity.**
_____ **BHT measured on each run.**
_____ **save samples from DSTs.**
_____ **cable stretch corrections utilized.**
_____ **repeat sections identified?**
_____ **log quality met?**

Oil Base Mud Removal

_____ **removal tests run on a representative sample of oil base mud with the cuttings. Do NOT use a laboratory sample.**

Solvent Removal of OBM

_____ **circulate 10 gal xylene/ft of net pay into zone. Slowly inject into zone.**
_____ **soak minimum of 4 hours. Precautions must be taken to keep xylene from floating up if water is in the hole (trap under a packer or plug or use a selective injection device).**
_____ **backflow xylene to surface or displace into reservoir (backflow is better).**
_____ **treat cuttings with HCl or HCl/HF and a mutual solvent.**
_____ **backflow if possible.**

Dispersant Removal of OBM

_____ **determine dispersant chemical need on representative field mud sample.**
_____ **circulate package to zone and inject.**
_____ **shut-in specified time.**
_____ **backflow if possible.**

Perforating
Workover Brief Specifications

_____ job objectives clear?
_____ interval and depth to be perforated?
_____ type (DP or BH) and size of charge specified?
_____ temperature rated charge required?
_____ gun/seals rated for hostile environment? Confirm pressure rating of gun systems (expendables and HSC).
_____ depth control method (and tolerance) specified?
_____ logging tools identified?
_____ size and type of gun/carrier specified. Confirm maximum gun size after firing.
_____ phasing specified.
_____ shot density.
_____ TCP or wireline.
_____ flow rate or volume to clean perfs. (1/8 bbl/perf positive flow is min. recommended flow vol.) Best flow rate is as fast as possible.
_____ which log is being tied into?
_____ date of log being tied into?
_____ perforating company.
_____ charge manufacturer and charge id number or size.
_____ will a full lubricator be needed (what pressures), field pressure test required at what pressure?
_____ hole displaced to filtered fluid?
_____ casing scraper run while displacing fluid?
_____ casing sub depth known? (are expected).
_____ hole restrictions, if any, older perforations, drill-out bridge plugs, etc.

Tubing Conveyed Perforating

_____ type of firing system (bar drop, pressure, elect. line, etc.)
_____ depth control proc. OK? (correlation log specified).
_____ surface press to fire if press activated.
_____ type of backup firing system?
_____ underbalance specified by press. and hydrostatic?
_____ bottom shot detector (if required).
_____ Gun release (if gun to be dropped).
_____ type of release?
_____ tool requirements?
_____ after firing gun size OK?
_____ circulation vent.
_____ RA pip tag needed?
_____ 100 hour charge life at BHT?
_____ log rerun after tubing spaced and well head flanged?

Wireline Conveyed Perforating

_____ gauge ring run?
_____ overbalance considered (if casing gun run by wireline).
_____ underbalance for thru-tubing guns? Underbalance in terms of fluid head.
_____ lubricator length and id?
_____ H_2S protected wireline needed?
_____ 24 hr min. charge life at BHT?
_____ sinker bars needed?

Before Firing Inspections

<u>Gun Body Inspection</u>

Port Plug Gun
_____ right phasing and spf.
_____ no splits, cracks, or corroded areas that could leak.
_____ no excessive swelling (limit 0.1" OD increase in tight clearance wells and 0.2" OD increase maximum).
_____ welded areas smooth and unpitted (eliminate leaks).
_____ no paint or debris on gun body (hides flaws). (Advise service company before job).
_____ port plug threads undamaged (limits blown plugs).
_____ minimum 3 threads on plugs.
_____ port plug sealing areas are smooth (seals better).
_____ port plug holes are round and diameter within 0.020" of specification.
_____ recess opposite port is clear.
_____ undamaged threads/seal areas on ends.
_____ gun body is clean inside.

Scallop Gun

_____ correct phasing and spf?
_____ gun body weight.
_____ high or low pressure gun (guns for low pressure wells are heavier wall).
_____ new seals on gun-to-gun connectors (tandems).
_____ no paint or deposits.

Charge/Detonating Cord/Detonating Cap

Charge
_____ make, Q/C and charge part number.
_____ date of manufacture of charge.

_____ were the charges sealed in a moisture proof package. If not sealed, charges older than 3 years in a dry climate and 6 months in a moist climate should not be used.
_____ DP charges should be powdered metal liners (no seam in copper liner).
_____ no cracks, chips, corrosion or scratches on liner.

Alignment Equipment

_____ correct alignment strip carrier for charge.
_____ position screws/pins used.
_____ correct alignment washer/sleeve, and port plug for gun/charge combination.
_____ verify top shot placement.
_____ are sample perforation charges to be save until after the job?
_____ recent card gap test on file for PYX charges?

Detonating Cord

_____ explosive grain rating of cord.
_____ correct type of detonating cord for charge.
_____ date of manufacturer of detonating cord. (< than 1 year old.)

Detonating Cap

_____ a resistor, fluid desensitized cap or safe detonating system must be used on wireline guns.
_____ part number or name of cap.
_____ a booster cap must be used at gun joints when joining guns. confirm reliable explosion transfer mechanism.)
_____ cap at bottom of most E-line fired guns.

<u>Loading Operation/Tools</u>

_____ blunt nose positioning tool used in loading port plug guns. Use right size positioning tool (never use a screw driver).
_____ port plug seal evenly extruded.
_____ correct charge securing clips in a scallop gun?
_____ avoid sharp bends and tight spots with detonating cord.
_____ pressure test gun at shop with internal air pressure.
_____ If plug loss is high, check hole size and tightening procedure.
_____ det. cord positioned against back of charge?
_____ strip centered in gun?
_____ verify top shot location?
_____ strip locked in place?
_____ mark empty gun sections.

Safety/Documentation/Final Check

_____ **Safety meeting with responsibilities set out clearly.**
_____ **check CCL operation with steel bar. Before connection to gun.**
_____ **sketch of gun showing distance from CCL to top and bottom shot.**
_____ **Record size and shape of fishing neck.**
_____ **Record maximum size of gun/equipment.**
_____ **radios off. (avoid operation near transmission lines, microwave towers). Welding equipment off.**
_____ **ground strap to wellhead. Monitor stray voltages.**
_____ **safety device on unit in safe position before arming gun.**
_____ **non critical personnel clear area before cap is installed.**
_____ **electrical blasting cap connection to be made before connection of cap to detonating cord. (Not witnessed, only service company to confirm.)**

Depth Control

_____ **depth control accuracy known**
_____ **measurement wheel calibration control is accurate.**
_____ **distance from CCL/GR to first shot is known?**
_____ **correction of open hole to cased hole gamma-ray and/or collars?**
_____ **adjust depths for kelly bushing?**
_____ **log correlation adequate? RA tag found?**
_____ **review depth control procedure?**
_____ **cable creep considered?**

After Firing

_____ **CCL check of perforated interval?**
_____ **service company checks gun for complete firing.**
_____ **debris in gun is pea to dime size (no whole charge cases).**
_____ **holes in scallops or port plugs are centered.**
_____ **holes are round.**
_____ **no solid copper debris in gun holes.**
_____ **number and location of blown plugs recorded.**
_____ **confirm CCL depth offsets.**
_____ **note location of bad shots.**
_____ **If a series of bad shots (more than 10% of total) is found - is reperforating necessary?**

Tank Inspections

Lined and Unlined Tanks

_____ **are the volume measurement charts correct for the type and size tank you are using?**
_____ **can tank be mixed or circulated?**
_____ **liner material OK with fluids being used?**
_____ **fluid inhibited (in unlined tank)?**
_____ **corrosion inhibitor life known and inhibitor replenishment schedule OK?**
_____ **all hatches have cover?**
_____ **is gauging possible without opening tank if using hazardous fluids?**
_____ **compatible unions on outlets to available hoses and other tanks to be coupled?**
_____ **H_2S service, waste service and salt water holding tanks not used (scale & deposits)?**

Lined and Unlined Tanks – empty

_____ **can bottom be observed and is it clean?**
_____ **condition of walls/bottom (scale, rust, mud, clean)?**
_____ **outlet and sample valve operation OK?**

Lined and Unlined Tanks – filled

_____ **number of compartments?**
_____ **record material type and height from top of tank to surface of material in each compartment?**
_____ **sample each compartment (if needed)?**
_____ **valves seating without leaking?**

Wireline

Slickline

Wire Inspection

_____ **Is a regular wire inspection program part of the service company's culture?**

_____ **wire can meet torsion (turn testing) criteria?**

wire size	new wire turns to break	In use turns to break, minimum
0.072" (1.68mm)		29
0.082" (1.83 mm)		26
0.092" (2.08 mm)		23
0.108" (2.67 mm)		20
0.125" (2.74 mm)	22	18

_____ **torsion break of wire is square (reject if break is jagged)**
_____ **if use is for sweet wells - wire has not been used in an H_2S well.**
_____ **if use is for sour well, wire stays in inhibitor pickling solution**

_____ **wire micrometer measurement is within tolerance?**

wire size	new minimum	In use minimum
0.072" (1.68mm)		
0.082" (1.83 mm)		
0.092" (2.08 mm)		
0.108" (2.67 mm)		
0.125" (2.74 mm)		

_____ **sufficient wire on spool to work to bottom plus at least 500 ft?**

BOP, lubricator and stuffing box

_____ **BOP's have been tested to seal around wire in use at maximum well pressure.**
_____ **on hazardous workovers, are the lubricator and BOP NACE certified?**
_____ **is lubricator tested for the maximum possible well pressure?**
_____ **is the stuffing box rebuilt before each major job?**
_____ **were the rubbers replaced when the stuffing box was rebuilt?**
_____ **were the flow tubes checked for wear and proper diameter for wire?**
_____ **does the grease injector have a working pressure control?**
_____ **are the grease injector lines in good shape?**

_____ does the grease in use in the stuffing box meet criteria for the conditions of the job?

Grease Injector Evaluation

_____ Blowing grease in the air? - the rubber is worn out.
_____ Losing grease in the well? - the flow tubes are too big or worn; or the braided line is worn - either way, there is too much clearance.
_____ The number of tubes depends on the pressure. The bottom flow tube needs to be very close to the diameter of the braided line.
_____ When grease use is high (over 10 lb/day) the operator may simply be pumping too much grease - way more than is needed for a seal.
_____ Greases comes in different viscosities, formulated for pressure and temperature combinations .
_____ If simply hanging gauges off in the well on the braided cable during a job, do not pump grease - just tighten up on the rubbers.
_____ Some greases thicken and/or emulsify with well or injected fluids, creating severe formation damage.

Tools

_____ workspace clean and tools in good repair?

_____ wellhead connection flange or coupling is known and wireline unit has a suitable connector.
_____ retrieval tools have sharp shoulders on catch dogs.
_____ oil jars rebuilt (if needed)?
_____ selection of jars, stem, and running and pulling tools adequate for the job?
_____ are a variety of overshots available for fishing operations?
_____ roller stem available for highly deviated wells (>50 degrees)

Pre Job

_____ safety meeting held and roles/responsibilities defined?
_____ spill avoidance criteria met?
_____ identify conditions when jobs should be shut down and who should shut it down.
_____ personnel warned to stay out of crane boom area.
_____ establish evacuation routes, meeting areas and responsibilities
_____ sheave connections to wellhead meet requirements of safety.
_____ avoid equipment placement that blocks evacuation route.
_____ ground strap is used where needed?
_____ stock of shear pins of various materials adequate for the job?
_____ wire drum drive in good repair? Brake OK?

_____ does the unit have some type of adjustable hydraulic control on drum drive?

Job

_____ well schematic available with all string dimensions, dog legs, deviations and restrictions labeled?
_____ all BHA tools measured with recorded diameters, lengths and thread patterns of each component of the BHA?
_____ measurement of collapsed and extended spang jars?
_____ paint or mark wire with a permanent depth flag about 300 ft from free end of wire.
_____ running speeds not to exceed 500 ft/minute until the first trip is made.
_____ drag measurements made at regular intervals?
_____ all plug pulling operations have proper equalization tools?

Fishing

_____ well schematic available with all string dimensions, dog legs, deviations and restrictions labeled?
_____ all information on measurements, identity and location of fish available to operator?
_____ wire torsion test done before fishing rig-up?
_____ all fishing tools have a release mechanism or a plan to retrieve wire when the tools are stuck?
_____ all catch tool edges are sharp (not severely rounded)?
_____ lubricator is long enough to contain tool and fish?
_____ wireline drag readings recorded at several places in well?
_____ maximum time to jar before stripping wire (100 ft) and re-heading is one hour?

Selected BP Specialists – note: this is in draft status, it will change to reflect the specialists listed in WVA

See WVA website for a complete and updated list of specialists

Well Completion - General –
- **Paul Adair**
- **Mary Endacott**
- **Dan Gibson**
- **George E. King**

Acidizing and Chemical Treating
- **Walt Lamb**
- **Phil Smith**
- **George E. King**

Artificial Lift -
- **Henry Nickens**
- **Tony Liao**

Cementing -

Coiled Tubing -
- **Rodney Stephens**
- **Charles Leslie**
- **Charlie Michel**

Corrosion -
- **John Martin**
- **John Alkire**
- **KC Lunden**
- **Steve Groves**

Downhole Tools -
- **Steve Ferris**
- **Dan Gibson**
- **Rodney Stephens**
- **Warren Winters**
- **Charlie Michel**

Drilling Muds –

Emulsions, Foams, Froths, Dispersions (Production Problems)
- **George E. King**

Fracturing
- **Mark Glover**
- **George Turk**

Heading Problems
- **Henry Nickens**
- **Tony Liao**

Horizontal Well Completions/Stimulation
- **Walt Lamb**
- **David Birse**
- **Warren Winters**
- **George E. King**

Kill Fluids -
- **George E. King**

Paraffins/Asphaltenes -
- **George E. King**

Perforating -
- **Steve Wilson**
- **Jack McAnear**
- **Phil S. Smith**
- **George E. King**

Explosives – general
- **George E. King**

Sand Control
- **John Gilchrist**
- **Fraser Elliott**
- **Ed Park**
- **Dave Tiffin**
- **Ian Palmer**
- **George E. King**

Scale -
- **Ian Collins**
- **Laurance Cowie**

Subsurface Safety Valves -
- **Mary Endacott**
- **George E. King**

Tubular Goods -
Phil Pattillo
Steve Morey

Water Control -
Kate Bell
Dan Borling

Wireline/Slickline
Steve Farris
Charlie Michel
Charlie Leslie