Guided Wave UT Target Items for Go-No Go Procedures

These target items are for guidance only and do not require that notifications contain only this material. Where operators have alternatives to this guidance, it is suggested that they include it along with any justification in their notification. PHMSA will review each notification on the merits of the individual submittal.

1. Generation of Equipment and Software – G-3 for GUL and Rev 3 for Teletest.
   The generation of both the equipment i.e. collar, and the computer algorithms is critical to the success of the inspection. Both major equipment vendors are on version 3 and older versions will not have as good range or results (similar to low resolution vs. high resolution ILI devices). If other versions of the equipment are to be used, the operator should provide additional procedures to ensure that all of the steps of the latest versions are included in the earlier versions (such as automatic diagnostics and collar capacitance testing, etc.).

2. Inspection Range – 60 ft. to 100 ft., 80 ft probably good max. to use
   The inspection range is dependent on several variables such as pipe diameter, pipe wall thickness, coating, coating condition and environment. Each of these helps or hinders the propagation of sound waves and thus can assist or reduce the range of the device. For all cases that require a range of greater than 80', some justification for the feasibility needs to be provided. If the 5% sensitivity cannot be achieved over the entire length of pipe to be inspected, then GWUT should not be used. Operators should use GWUT at each end of a casing. There should be sufficient overlap from of the GWUT from both sides of the casing to provide for a maximum threshold sensitivity of 5% in the middle of the casing

3. A 20% Overlap needs to be provided or alternative such as several shots with different starting location.
   A method to validate that the entire casing has been evaluated is to mandate that there is at least a 20% overlap in the GWUT shots from both ends of the casing. If a 20% overlap is not possible because of the dead zone and the near zone, then operators should provide two shots from each side that both cover the dead zone and near zone (or an acceptable alternative such as B-scan UT) and then provide the overlap in the middle. This can be accomplished by moving the collars away from the casing by 10' to 15' and then moving them to the start of the casing for an additional shot to provide the overlap. Where sufficient overlap can not be achieved, GWUT may not be feasible. If 20% overlap is not achievable, PHMSA may consider other overlap criteria with proper justification of overall GWUT quality.

4. Sensitivity – threshold of 5% Cross Sectional Area for Go-No Go.
   The sensitivity for GWUT should be run for the location at, 3%, 4% and 5% of the CSA (Cross Sectional Area). Where possible, 3% or 4% CSA sensitivity should be used, but this could reduce the effective range of the GWUT so that the required overlap can not be accomplished as specified in Item #3. If background noise is too great to use either a 3% or 4% sensitivity, then 5% CSA sensitivity may be used. The operator should measure and report the distances at which 3%, 4%, and 5% sensitivity are achieved. The locations and estimated CSA of all detectable metal loss features should be determined and reported.

5. Frequency – can be 15 to 50 kHz, normally 20 to 40 kHz
   The frequencies used for the inspections must be in the range specified by the manufacturer of the equipment. The frequency for each inspection may be different. A sufficient number of frequencies need to be run for each shot as to determine the best frequency for categorizing the location and clock position of any indications. After these optimum frequencies have been determined, a check of these frequencies should be made on at least 3 frequencies (the frequencies used should be the optimum and then a frequency greater than and one less than the optimum). The number of frequencies both run and utilized needs to be documented.

6. Signal or Wave Type – torsional and longitudinal
   Most GWUT equipment can provide both torsional and longitudinal signals. Although the use of torsional waves may produce the best results, longitudinal waves should also be considered. Documentation of the wave type must be provided. Where only one wave type is available, it must be torsional.

7. DAC – required for each inspection
   DAC is method of measuring the effective range of a GWUT test and must be performed for each inspection. The method takes into account coating, pipe diameter, pipe wall and environmental conditions at the test site.

8. Dead Zone – 3 to 6 ft. from collar
   The physics of the GWUT device reduces the effective distance to obtain reproducible results just ahead of the collar due to reflecting sound waves and other interferences. This distance depends on the coating, coating condition, pipe diameter, pipe wall and the environment. Different equipment can yield different dead zones but since a majority of indications in casings are typically located within the first few feet, care must be taken to place the collar sufficiently away from the start of the casing. One method may be to move an initial test 10' from the casing and then move up to the casing for subsequent tests. Operators who use a smaller dead zone than the minimum must provide data to justify the reduction. An alternate method of obtaining valid readings in the dead and near zones can be using B-scan ultrasonic equipment to determine if any wall loss indications exist. The length of the dead zone must be documented for each inspection. If the exact distance cannot be determined, then a minimum default distance of 3 feet on either side of the transducer collar should be used.

9. Near Zone – function of frequency – 1 to 2 ft. out from dead zone
   As with the dead zone, the near zone is a function of the physics of the wave forms and can add several more feet to an area with poor or inconclusive results caused by unfocused beams and reflections. Different frequencies can lengthen or shorten this area and it needs to be taken into account because of the issue that the first few feet of the casing is typically where many of the indications will be found. Like with the dead zone, taking the initial test 10' away and then moving subsequent tests to the start of casing will take this into account. Operators who use a smaller or no near zone than the minimum must provide data to justify the reduction.

10. Coating type- inspections have been on coal tar enamel, FBE, wax, extruded with some girth welds coated with tape and shrink sleeves, have not affected results.
    Several coating types may affect the quality of the GWUT results to the point that they may not provide any useful information. There have been essentially no tests with concrete coated pipe and this type of coating may be problematic and should be evaluated above ground or on pipe outside of a casing prior to performing a test on cased pipe. If an inspection is done and the required sensitivity is not achieved for the entire length of the cased pipe, then the use of GWUT is not feasible and another type of assessment method must be utilized.

11. End Seal – always remove end seal and visually inspect 1st 2 to 5 feet of pipe in casing.
    Inspection of the first several feet of the carrier pipe in the casing is necessary for PHMSA to accept the GWUT test without objection. The boots must be removed and 360 degree visual inspections with sufficient light must be documented. If possible, miniature cameras should be used to record any indications. The majority of indications on carrier pipes in casings occur in the first several feet and this area is critical to the integrity of the pipeline. Where casings are angled, water and debris can collect on one side and cause electrolytic shorts. Venting can also be a source of moisture and debris and are typically located near the casing ends. There may be situations where the end seal does not have to be removed (such as clearances with road surfaces or railroad tracks), in such cases a justification must be provided and documented. If the casing is shorted,

additional justification for not correcting the shorted condition must be supplied with the notification.

12. Weld Calibration – good method to set DAC curve. The weld has to be excavated and measured either before or after the calibration shot.
    Welds in the secondary area can be a good method to set the DAC curve and to validate the equipment. In order to use these welds in the secondary area, sufficient distance must be allowed to take the dead zone and near zone distances into account. Having a weld, especially in the near or dead zone, between the transducer collar and the calibration weld is not permitted. The welds need to be exposed and measured to ensure that the equipment is correctly sizing and locating them. Calibrations should be on pipe with similar properties such as wall thickness and coating. If the actual cap height is different from the assumed cap height, the estimated CSA may be inaccurate.

13. Validation of Operator Training – Level II minimum
    Each equipment manufacturer must certify the training of both the equipment operator and the analysts reviewing the curves. As a minimum, they should be certified to a Level II basis on the particular equipment via a training program modeled after ASNT or similar recognized training accreditation society. If an operator can provide documentation that the Level I equipment operator has sufficient experience (equivalent to a Level II equipment operator), then a Level I equipment operator is acceptable. All analysis of the data collected by a Level I equipment operator/analyst must be supervised or performed by a Level II operator/analyst.

14. Equipment – should be traceable from vendor to contractor.
    The equipment must be readily traceable back to the manufacturer and all computer software must be the latest version and must be documented. Other equipment such as collars and transducers must be traceable and be of the latest version (unless noted and justified). Only individuals, who have been certified by the manufacturer, as specified above, shall operate the equipment. The version of the GWUT software used, and the serial number of the equipment used must be documented.

15. Calibration, Onsite – diagnostic test on site and system check on site. Prior to shipment owner to perform calibration checks.
    The equipment must have been calibrated per the equipment manufacturer's specification for both performance and time between calibrations prior to being shipped to the operator. A diagnostic check and system check shall be performed on-site and each time the equipment is relocated. Where on-site diagnostic checks show deviations from the acceptable limits established by the manufacturer, the testing should be halted until the equipment can be restored to the manufacturer's specifications.

16. Use on shorted (either direct or electrolytic) casings is not permitted.
    Shorted casing may interfere with some of the test results especially on direct shorts where there are metal to metal contacts. Because of the developmental nature of GWUT testing, until conclusive results show that there are not interferences in determining the location of indications, all shorts must be cleared prior to testing. Where an operator has sufficient information to show that shorted casing will not interfere with the GWUT testing, such justification can be used to allow testing on shorted casings.

17. Direct examination of all indications above the testing threshold is required.
    The use of GWUT in the "Go-No Go" mode requires that all indications above the testing threshold (3%, 4% or 5% of CSA sensitivity) be directly examined (or replaced) prior to completing the integrity assessment on the cased carrier pipe. If this can not be accomplished then the use of GWUT is not considered feasible and alternative methods of assessment (such as hydrostatic pressure tests or ILI) must be utilized.

18. Timing of direct examinations of indications above the testing threshold.

All indications that are identified must be scheduled for direct examination. Examinations must be done promptly and appropriate compensatory actions should be taken to assure safety in the interim. PHMSA would find the following actions appropriate:

a) A maximum time frame to examine indications of 6 months for those pipelines operating at greater than 30% SMYS and 12 months for those operating at or below 30% SMYS.

b) For those locations where the operating pressure is greater than 50% SMYS, reducing pressure to 80% of the operating pressure at the time the indication is "discovered" by the GWUT.

c) For those locations where the operating pressure is greater than 30% and less than or equal to 50% SMYS, not exceeding the operating pressure at the time of the "discovery" of the indication and monthly leak testing until the indication is directly examined.

d) For those locations where the operating pressure is less than or equal to 30% of SMYS, performing leak testing once a month until the indication is directly examined.