



*Guided Ultrasonics Ltd.*

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# **Training and Qualification Scheme**

## **For the Wavemaker™ Pipe Screening System**

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### **DISCLAIMER**

This Training and Qualification Scheme attempts to provide a basis for providing adequately trained operators who are able to use The Wavemaker™ Pipe Screening System and associated software.

The correct use of the Wavemaker™ Pipe Screening System relies heavily on the interpretation of the data by the operator and the application of the testing technique to inspect appropriate systems. The system should only be used by Guided Ultrasonics Ltd. trained operators, and only on piping applications for which they were trained.

Guided Ultrasonics Ltd. assumes no responsibility for any inaccuracies of the results obtained

## Definitions

- Guided Ultrasonics Ltd. will be referred to in this document as GUL
- Wavemaker™ Pipe Screening System will be referred to in this document as WPSS

This document comprises the following sections for ease of reference and can be accessed and downloaded at any time from the GUL website [www.guided-ultrasonics.com](http://www.guided-ultrasonics.com)


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## Section 1 General introduction

The GUL WPSS uses guided wave technology as a screening technique for pipes. Respected people within the NDT industry have described this technique one of the few genuinely new techniques to be introduced in the last 20 years. This in itself presents a whole new set of challenges to ensure that all operators are trained and competent to use the equipment, to gather data and interpret the results.

The introduction of any new technology is never easy and is very dependent on the reputation it gains on every job undertaken using it.

It is recognised that this technique is very operator dependent so this training scheme has been updated to clarify the experience levels recommended for applications and more importantly to ease the transition of a Level 1 operator to Level 2. This has been achieved by the development of supplementary courses which will act as stepping stones to Level 2.

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GUL has designed the WPSS equipment such that the data collection under default parameters is fully automated allowing the operators to concentrate on interpretation. The ability of the operators is crucial to the successful implementation of this technique.

With this in mind GUL has adopted the policy that the first equipment purchase by any user organisation **must** always include a training and support package. This package consists of a 5 day theoretical and practical Level 1 training course followed with at least one week of field support by a GUL trainer, for the newly trained operators. Purchasers are recommended to only use GUL qualified technicians as the lead inspector in any WPSS team.

**GUL is conscious that:**

1. The reputation of the technique is inextricably linked to the ability of the operators.
2. At present GUL consider no other organisation is sufficiently experienced in the application of this technology, the Wavemaker™ equipment and Wavepro software to undertake either the training or to develop training courses.

This technology is not sufficiently mature for generic guided wave training courses to be held by specialist training organisations in the NDT field for two main reasons:

- Firstly no industry agreed performance/training/examination standards exist.
- Secondly the training is very much equipment/software related.

It is possible however, that as the technique becomes more widely available and matures that a Training Scheme may be accredited and carried by one or more of the recognised independent training/qualification bodies.

3. In compiling this training document ASNT and PCN training schemes, as they are industry recognised standards, have been used as guidance. The significant difference, however, is that the GUL Level 1 is allowed, with some specified restrictions allowed to both collect and interpret WPSS data (refer appendix 1). Generally similarities can be drawn as to how it is used and maintained as an overall scheme.
4. There are other types of guided wave equipment on the market so GUL recognises that although the physics governing the operation of all the systems is very similar the method of application is very different and that GUL training refers only to competence in operating the WPSS.
5. All training qualifications are authorised by the GUL Chairman in order to ensure compliance with this Training and Qualification Scheme.

**Section 2 Physical requirements**

All candidates shall have natural or corrected vision (in at least one eye) to be able to read from a standard test chart Jaeger # 1 (or similar) at a distance of not less than 30cm (1ft).

It is the responsibility of the candidate's employers to ensure that this requirement is met and checked periodically.

**Section 3 GUL Levels of qualifications**

Level	Recommended education, training and experience for each level	Summary of training	Recommended scope of duties	Validity of qualification
1	<ul style="list-style-type: none"> <li>• <b>Either</b> an experienced Level 2 UT technician (e.g.ASNT,PCN)</li> <li>• <b>Or</b> Degree or HNC in a technical subject.</li> </ul>	<p>5 day training course. All newly qualified technicians require a minimum of 5 days documented field experience under the tutelage of a GUL qualified operator which must be completed within 3 months of the course.</p> <p>The course comprises the following main subjects.</p> <ul style="list-style-type: none"> <li>• Data collection</li> <li>• Basic Guided Wave theory</li> <li>• Basic interpretation</li> <li>• Level 1 fault finding</li> <li>• Report preparation</li> </ul> <p>Must pass written, practical and interpretation tests and achieve overall mark of at least 80%.</p>	<p>A Level 1 should be capable of:</p> <ul style="list-style-type: none"> <li>• Setting-up and checking equipment and perform tests under default collection parameters.</li> <li>• Carrying out interpretation for basic applications and report results. (see section 5)</li> <li>• Basic fault finding.</li> <li>• Varying test parameters under the supervision of a level 2/3</li> </ul>	<p>Following satisfactory completion of site experience initial issue will be for 1 year then subsequent revalidations may be for up to 3 at the examiners discretion</p>
2	<p>Level 1 qualification and at least 200 points made up from the following</p> <ul style="list-style-type: none"> <li>• 1 point for each day testing at level 1</li> <li>• 2 points for each day worked with a Level 2</li> <li>• Attend refresher/supplementary courses see Appendix 5 for points</li> </ul>	<p>Minimum 5 day course comprising the following.</p> <ul style="list-style-type: none"> <li>• Level 2 Guided Wave theory</li> <li>• Advanced interpretation buried pipe, road crossings etc.</li> <li>• Use of wide frequency equipment</li> <li>• Advanced calibration systems and use of multiple rings and G3 Wavemakers.</li> <li>• Advanced troubleshooting</li> <li>• Use of longitudinal mode</li> <li>• Detailed review of level 1 work</li> </ul> <p>Must pass a written test, interpretation test and review of Level 1 work.</p>	<p>A Level 2 should be capable of:</p> <ul style="list-style-type: none"> <li>• Selecting optimum test parameters.</li> <li>• Carrying out tests and interpretation for advanced applications. (see section 5)</li> <li>• Supervising and audit of Level 1 activities.</li> <li>• Supporting Level 1 operators.</li> <li>• Adapting general procedures to be job specific.</li> <li>• Carrying out advanced fault finding.</li> </ul>	<p>3 years from issue or revalidation</p>
3	<p><b>Either</b> Level 2 qualification for a minimum of 1 year with Level 2 field experience in all areas of operation. <b>Or</b> engineering degree or higher in a related field and be a Level 1.</p>	<p>5 day course comprising the following.</p> <ul style="list-style-type: none"> <li>• Advanced Guided Wave theory</li> <li>• Discussion of examples</li> <li>• Procedure development</li> <li>• Auditing</li> </ul> <p>Must pass written and practical test</p>	<p>A Level 3 should be capable of:</p> <ul style="list-style-type: none"> <li>• Procedure development</li> <li>• Auditing of Level 1 and 2 operators</li> <li>• Assisting with training Level 1 and 2</li> </ul>	<p>5 years</p>

#### Section 4 Records required for revalidation

All users of WPSS equipment are encouraged to produce written procedures for specific applications so that Level 1 operators use the optimum test parameters as designated by the Level 2/3 operator. GUL provide a generic procedure as part of the training package which can then be tailored to client specified requirements.

All trained technicians are requested to maintain a log of their testing activities along with examples of tests that show a variety of applications, features and in particular calls that have been made especially if prove up/photos are available. These records along with examples will be the subject of detailed discussions when a candidate is training for a higher level.

See Sample log sheet below

Date	Site	Approx. # of locations tested	File ID #'s	Level 2 supervision details	Brief description of type of tests along with any interesting results/calls

#### Section 5 Summary of suggested qualification levels for commonly encountered applications

The table in Appendix 1 lists the most commonly encountered applications along with the recommended qualification level for gathering and interpreting data using WPSS data.

All recommended levels are minimum level. It is always recommended that results are audited/checked by another GUL qualified operator.

For information on other applications that are not listed please contact [support@guided-ultrasonics.com](mailto:support@guided-ultrasonics.com).

#### Section 6 Maintenance of validity of qualifications

Refer to Appendix 2 of this procedure for the table of requirements and appendices 3 and 4 for the relevant application forms.

Note it is the operator's responsibility to apply for revalidation.

#### Section 7 Supplementary training courses

Appendix 5 of this procedure for a list of supplementary courses.

Experience to date has demonstrated that the transition from Level 1 to Level 2 has been too large step without additional formal training.

Recognising this GUL has developed a series of supplementary courses.

In addition to addressing the issue of Level 1 to Level 2 transition these supplementary courses will extend the applications that can be carried out by the upgraded Level 1 operators.

These courses are designed to be held either in the GUL London office or at the client location.

## Section 8 Description of qualification certificates and methods of checking validity and appropriate applications

- 8.1 Figure 1 is a sample temporary certificate. This is issued upon successful completion of the level 1 course by the course tutor. They are sequentially numbered and only valid for a 3 month period  
 The purpose of this certificate is to allow operators to be able to demonstrate that they are a newly qualified Level 1 operator still under the site tutelage.



Fig.1 (normal size A5)

- 8.2 Figure 2 is a sample GUL qualification certificate. This is issued upon successful completion of Level 1 (and subsequent site tutelage), This certificate is embossed with the GUL company seal.



Fig. 2 (normal size A4)

8.3 Figure 3 is a sample of a credit card type certification, which is issued to each qualified technician. This card will show the operator's photograph, qualification level and course codes for supplementary courses passed (see course codes Appendix 5)

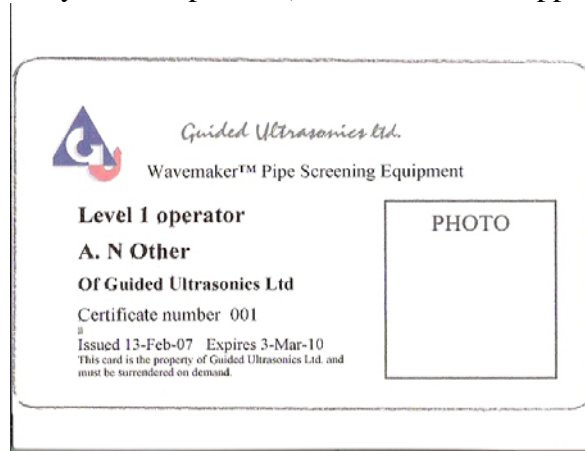


Fig 3 Qualified operator card (normal credit card size)

8.4 Qualification level and validity should be checked in the first instance by asking the lead operator for his card. Validation confirmation can also be obtained from GUL by e-mail [support@guided-ultrasonics.com](mailto:support@guided-ultrasonics.com). When requesting qualification information please quote as a minimum the technician's name and employer.

### Table of suggested qualification levels for applications for commonly encountered applications

Notes:-

1. For Training applications the required qualification levels are mandatory for all other applications they are recommended.
2. Supplementary courses are listed in appendix 5 of the Training Qualification Scheme.

Application description	Type of application	Minimum Qualification level
<b>Training</b>		
Level 1 training course (Lead trainer)	Advanced	Level 3 Only
Level 1 training course (second trainer)	Advanced	Level 2
Level 2 training	Advanced	GUL only
Level 1 Examination and issue of qualification certification		GUL only
Level 3 training	Advanced	GUL only
Procedure development	Advanced	Level 2 and 3
Written practice for applications	Advanced	Level 2 and 3
Auditing reports	Advanced	Level 2 and 3
Auditing field activities	Basic	Any attendance of GUL appreciation course and any GUL qualified operator
Auditing of results/findings	Intermediate	Level 2 and 3
<b>General testing</b>		
Standard testing generally where the pipes have clearly defined discrete features and the expectation is to locate all features over 5% change in cross section	Basic	Level 1
Pipes which may have a high density of features where the expectation is to locate and classify <b>all</b> features above the noise threshold.	Advanced	Level 2
<b>Simply supported long runs of pipe</b>		
Long lengths of simply supported pipe in pipe rack	Basic	Level 1
<b>Monitoring</b>		
Simple sample monitoring (in place of random thickness checks)	Basic	Level 1
Monitoring after period using "repeat shot" and "overlay" features	Basic	Level 2 and Level 1 after taking <b>PIMS</b> supplementary training module
<b>Buried pipe applications</b>		
Road crossings in sleeves painted (no special coatings)	Basic	Level 1
Road crossings in sleeves painted (no special coatings) with centring lugs	Intermediate	Level 2 and Level 1 after taking <b>Sleeved/cased road crossings and interface screening</b> supplementary training module
Buried pipe in sand/earth painted (no special coatings)	Intermediate	Level 2 and Level 1 after taking <b>Continuously buried pipe and high attenuation applications</b> supplementary training module
Buried pipe with attenuative coatings	Intermediate	Level 2 and Level 1 after taking <b>Continuously buried pipe and high attenuation applications</b> supplementary training module
Short transitions through bund/berm walls etc	Intermediate	Level 2 and Level 1 after taking <b>Sleeved/cased road crossings and interface screening</b> supplementary training module

Application description	Type of application	Minimum Qualification level
<b>Different materials</b>		
Stainless steel	Basic	Level 1
Plastic to check welds	Advanced	Level 3
<b>Testing pipes with different contents</b>		
Gas-low velocity	Basic	Level 1
<b>Identification of specific defects</b>		
Gas-high velocity	Basic	Level 1
Low viscosity liquid	Basic	Level 1
High viscosity liquid	Basic	Level 1
Very high viscosity liquids	Intermediate	Level 2 (Level 1 under instruction)
Liquids that leave attenuating internal deposits	Intermediate	Level 2 and Level 1 after taking <b>Continuously buried pipe and high attenuation applications</b> supplementary training module
Minor internal scale up to say 2mm thick	Basic	Level 1
Internal Scale over 2mm thick	Intermediate	Level 2 and Level 1 after taking <b>Continuously buried pipe and high attenuation applications</b> supplementary training module
Erosion	Advanced	Level 2
Defects in bends	Advanced	Level 2
Defect in weld	Advanced	Level 2
Identifying corrosion under simple supports	Basic	Level 1
Identifying corrosion under simple supports	Advanced	Level 2 (Level 1 under instruction)
Identifying corrosion under welded/clamp supports	Advanced	Level 2
<b>Testing pipes with coatings</b>		
Paint	Basic	Level 1
Mineral wool insulation	Basic	Level 1
Polyurethane foam	Basic	Level 1
Polyethylene coating	Basic	Level 1
Spun epoxy coating	Basic	Level 1
Epoxy hand applied Splash zone coating	Advanced	Level 2 (Level 1 under instruction)
Bitumen wrapped pipe in interface zone say up to 2m.	Advanced	Level 2
Bitumen wrapped pipe maximum range.	Advanced	Level 2
Concrete lined	Advanced	Level 2 and Level 1 after taking <b>Continuously buried pipe and high attenuation applications</b> supplementary training module
Denso wrapped	Advanced	Level 2 and Level 1 after taking <b>Continuously buried pipe and high attenuation applications</b> supplementary training module
Corrosion scale removal by wire brush	Basic	Level 1
Severe corrosion with layers of scale that have to be removed by chipping off.	Basic	Level 2 and Level 1 after taking <b>Continuously buried pipe and high attenuation applications</b> supplementary training module
<b>Specific applications</b>		
Testing of sphere legs under concrete fireproofing	Advanced	Level 2
Risers	Advanced	Level 2
Very noisy environments	Advanced	Level 2

Application description	Type of application	Minimum Qualification level
<b>Sub-sea</b>		
All sub sea activities are considered advanced	Advanced	Level 2

**Example**

Where a pipe requires testing appears in good condition and is supported it would, according to the above list be a basic application carried out by a level 1 technician. If this same pipe is wrapped in denso tape then the application becomes more involved and becomes a more advanced application requiring a more experienced level 2 technician.

Generally several parameters apply to any pipe so the most severe operator requirement is the one that governs the recommended qualification level.

refer to [www.guided-ultrasonics.com](http://www.guided-ultrasonics.com) to check issue status  
 Uncontrolled copy

Qualification validation table

Qualification	Period of validation	Validation procedure	How Validation is notified by GUL
Level 1 (temporary)	3 months	Temporary certificate Issued by the Course Tutor to trainees who pass the Level 1 course.	Issue of hand written “temporary” certificate by course tutor
Level 1	1 year	<ul style="list-style-type: none"> <li>• Need to submit completed <b>Qualification Revalidation Form (appendix 3).</b></li> </ul>	By issue of operator qualification card and certificate
Revalidation of Level 1 at expiry.	3 years	<ul style="list-style-type: none"> <li>• Need to complete GUL form <b>level 1/2 Probationary/revalidation</b> and submit along with operator testing log and electronic copies of tests referred to on above form.</li> </ul>	By issue of operator qualification card
Validation of experience to attend Level 2 course	Not applicable	<ul style="list-style-type: none"> <li>• Need to submit completed <b>Level 2 Prequalification Training Experience form (appendix 4)</b></li> </ul>	Invitation to attend a Level 2 course
Level 2	3 years	<ul style="list-style-type: none"> <li>• Attend level 2 course and pass written and practical examinations</li> </ul>	By issue of operator qualification card
Revalidation of Level 2 at expiry	3 years	<ul style="list-style-type: none"> <li>• Need to submit completed <b>Qualification Revalidation Form (appendix 3).</b></li> </ul>	By issue of operator qualification card
Revalidation of Level 3 at expiry	3 years	<ul style="list-style-type: none"> <li>• Need to submit completed <b>Qualification Revalidation Form (appendix 3).</b></li> </ul>	By issue of operator qualification card

**Note:** In the event that a validation submission fails a report will be issued to the applicant giving actions required to achieve revalidation.



Qualification revalidation form

Name of applicant	Company	Date
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The purpose of this form is to allow GUL to review results from actual activities of GUL qualified operators.

Successful review will result in the issue of a GUL Level 1 operator qualification card valid for 12 months for newly qualified operators. For those renewing Level 1 or 2 operator qualification cards, the supplied data will allow GUL determine if the operator has made regular use of the WPSS equipment and ongoing performance as an operator.

Section 1 Basic Training History

Training History	Date	GUL Trainer
Level 1 Course		
Supplementary courses		
Level 2 course		
Log of days testing (i-button data)		

Section 2 Specific experience:

Operators are requested to supply a CD with at least 10 results and an overview report of their initial testing activities.

For Level 1 It is not necessary to have experience in all the areas mentioned below but it would be helpful to give examples in as many as possible and especially to give some examples of traces where you have experienced faults/difficulties along with a brief explanation of the actions you took.

For Level 2 at least one result is expected for each category.

Category	Test trace numbers provide on CD with photos prove up reports etc. as appropriate	For GUL use
Testing for corrosion under insulation		
Testing road crossings		
Testing pipe with coatings		
Testing for corrosion at supports		
Testing buried pipe		
Traces indicating faults with the equipment		
Other		
Other		

Additional information

Reviewed for GUL	Date	Assessment notes
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**LEVEL 2  
PREQUALIFICATION  
TRAINING  
EXPERIENCE**

Name:  
Company:  
Date:

**Training Scheme Appendix 4**

**Section 1 Basic and supplementary training**

Date of GUL level 1 course	Name of GUL trainer	For GUL use
Dates supplementary course attended	Name of GUL trainer	Pts as per appendix 5
Dates worked under tutelage of level 2	Name of GUL level 2 operator(s) and # of days	Pts 2 per day

**Section 2 Level 1 Experience summary**

	Number	For GUL use
Approximate number of days worked as lead operator Attach a log similar to the sample attached and/or i-button data Enter total number		Pts 1 per day

**Section 3 Specific experience**

	Test trace numbers (10 max) provide on CD with photos, prove up, report etc. as appropriate	For GUL use	
Testing for corrosion under insulation		Max 10	
Testing road crossings		Max 10	
Testing pipe with coatings		Max 10	
Testing for corrosion at supports		Max 10	
Testing buried pipe		Max 10	
Traces indicating faults with the equipment		Max 10	
Other		Max 10	
Total			

**Section 4 General**

Briefly outline your reasons for wishing to attend the Level 2 course and what you hope to gain from it.



## Appendix 5 List of Supplementary Courses

Notes:-

1. The points are relevant to gaining eligibility to participate in a Level 2 course.
2. All supplementary courses will be tested by examination which will comprise a set of multiple choice questions and computer tests of relevant archived data.
3. After successful completion of a supplementary training course the qualified operator card will be reissued with course reference added.
4. If any two 3 day courses are taken together the overall duration will be 5 days as there is some overlap of content.

Course reference	Supplementary Training course	Course Duration (days)	Points
P	<b>PIMS (Permanently Installed Monitoring System) installation and monitoring course.</b> This covers the selection of monitoring points, the installation of PIMS kits in the field, Programming of “one wire” ring identifiers. How best to compare data to maximise usefulness as a monitoring tool.	3	20
X	<b>Sleeved/cased road crossings and interface screening</b> This covers how to overcome main problems, review of previously collected data, more study of how best to determine size and extent of features and best way to present results. Primarily for crossings to meet US DOT/PHMSA requirements.	3	20
B	<b>Continuously buried pipe and high attenuation applications</b> This covers how to overcome main problems, review of previously collected data, more study of how best to determine size and extent of features and best way to present results.	3	25
U	<b>G3 upgrade/refresher course including use of EFC (Enhanced Focussing Capability)</b> This covers the operational differences between SE16 and G3 including best way to utilise this new feature and reviews previously collected data	2	20
W	<b>Use of wide frequency transducer modules</b> <b>Note (this is covered in X and B courses)</b> This covers how and why you may need to operate within a different frequency range and how to do it.	1	10
A	<b>Auditing of results and field activities</b> This covers the use of standard checklists for auditing all activities. It will provide suggested checklists and will review examples.	1	10
S	<b>Inspection of supports</b> This covers mainly the identification of corrosion at simple and clamped supports. The identification of corrosion at welded supports is discussed but is a level 2 course topic.	3	30
T	<b>T-Scan</b> Covers the use of internal probes and use of Tubepro™ software	3	30