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U.S. Department
of Transportation

East Building, PHH-30
1200 New Jersey Avenue S.E.
Washington, D.C. 20590

**Pipeline and Hazardous
Materials Safety Administration**

DOT-SP 15610
(SECOND REVISION)

EXPIRATION DATE: April 30, 2018

(FOR RENEWAL, SEE 49 CFR 107.109)

1. GRANTEE: TechKnowServ Corp.
(Former Grantee: WavesInSolids LLC)
State College, PA
2. PURPOSE AND LIMITATIONS:
 - a. This special permit authorizes the transportation in commerce of certain gases in DOT 3A, 3AA, 3AX, 3AAX and 3T cylinders. The cylinders (tubes) are retested by acoustic emission and ultrasonic examination (AE/UE) described in paragraph 7 below in place of the internal visual inspection and the hydrostatic retest required in § 180.205. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.
 - b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce.
 - c. No party status will be granted to this special permit.
3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.
4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR §§ 180.209(a), the introductory paragraph and the Table; 180.205(c), (f), (g), and (i); 173.302a (b)(2), (3), (4), and (5) in that the AE and UE are performed in place of the hydrostatic test and

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the internal visual inspection; and 180.213 in that the retest month and year are stamped on the data plate and affixed to the rear bulkhead of the unit when tested as a unit.

NOTE: This does not relieve the holder of this special permit from securing an approval for retesting cylinders from the Associate Administrator for Hazardous Materials Safety.

5. BASIS: This special permit is based on the application of TechKnowServ Corp. dated September 28, 2015 submitted in accordance with § 107.105.
6. HAZARDOUS MATERIALS (49 CFR 172.101):

Hazardous Materials Description			
Proper Shipping Name	Hazard Class/ Division	Identification Number	Packing Group
Liquefied or non-liquefied compressed gases, or mixtures of such compressed gases, classed as Division 2.1, Division 2.2, or Division 2.3 which are authorized for transportation in DOT Specification 3A, 3AA, 3AX, 3AAX and 3T cylinders.	2.1, 2.2, or 2.3 as appropriate	As Appropriate	N/A

7. SAFETY CONTROL MEASURES:

a. PACKAGING - Packaging prescribed are DOT 3A, 3AA, 3AX, 3AAX and 3T cylinders, mounted on a tube trailer vehicle chassis or a tube module equipped with a frame that is subjected to periodic retesting, reinspection and marking prescribed in §§ 180.205, 180.209, and 180.213 except that:

- (1) Each cylinder is examined by external visual examination in accordance with the CGA Pamphlet C6.
- (2) The acoustic emission and ultrasonic examination (AE/UE) are used in lieu of hydrostatic pressure test and internal visual inspection.

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(3) The retest month and year are stamped on the dataplate and affixed to the rear bulkhead of the unit when tested as a unit in lieu of the stampings on the cylinder.

(4) Each cylinder must have an outside diameter equal to or greater than 245 mm (9-5/8 inch) and a minimum water capacity of 120 liters (31.7 U.S. gallons). The minimum wall thickness must be equal to or greater than those specified in the table given below:

Spec	Diameter (inch)	Minimum Design Wall Thickness (inch)	Marked Service Pressure (psi)
3T	22	0.400	2400
3AAX	22	0.514	2400
3AA	22	0.514	2400
3AA	9-5/8	0.224	2400
3A	9-5/8	0.283	2400
3AX	22	0.514	2400

(5) Each cylinder must be retested in accordance with the procedures specified in the WavesinSolids LLC (WSL) application for special permit on file with the Approvals and Permits Division and as prescribed in this special permit.

b. TESTING - Cylinders must be retested at least once every five (5) years. The following apply to cylinders tested as a unit (tube trailer and ISO framed) as well as tubes tested individually. Prior to retest, a copy of the previous retest report must be reviewed to verify the date of external thread inspection.

(1) Visual Examination: Each tube must receive an external visual examination in accordance with CGA Pamphlet C-6.

(2) Neck Threads: External threads of each tube with diameter greater than or equal to 18" and mounted on tube trailer or modules must be inspected once every ten (10) years in accordance with the inspection procedure that is on the DOT website at

<http://hazmat.dot.gov/enforce/forms/ohmforms.htm#guidance>

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(3) Acoustic Emission (AE) Equipment: The AE equipment must be in accordance with the specification described in WSL's application on file with the Approvals and Permits Division and as prescribed in this special permit. The power supply, signal cable, signal processor and couplant must meet all requirements of the American Society for Testing and Materials (ASTM), 1419-02b Standard Test Method for Examination of Seamless, Gas-Filled, Pressure Vessels Using Acoustic Emission.

(4) AE Calibration and Standardization: Calibration of AE equipment performance and test procedure must be in accordance with ASTM E 1419-02b and WSL's test method on file with the Approvals and Permits Division, except as specifically stated herein.

(5) AE Test Pressurization:

(i) The test pressure must equal 1.1 times the highest fill pressure experienced by any individual cylinder in the unit for the last 12 months prior to requalification. If the highest fill pressure is not available the test pressure must be 1.20 times the lowest service pressure stamped cylinder in the unit.

(ii) The data collection must begin at a pressure less than or equal to 50% of the AE test pressure. The rate of pressurization must be such that the saturation of electronic circuitry does not occur.

NOTE: AE retest per this special permit shall not be used to requalify a cylinder that had been hydrostatically tested within the last 1 year.

(6) AE Test Evaluation & Markup:

(i) Each acoustic emission (AE) site on the cylindrical portion of each cylinder (tube) that produces 5 or more events within an 18-inch (458mm) axial distance must be marked for the follow up ultrasonic examination (UE) as prescribed herein.

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(ii) Each AE site on the tube ends (i.e. sections of the tube that lie outboard of the sensors) which produces five or more events which hit both sensors and which had 43 dB or greater peak amplitude at the "first hit" sensor, must be subjected to UE by using shear wave.

(7) Ultrasonic Examination (UE) Equipment (Apparatus): The UE equipment must be in accordance with the specification described in ASTM E-2223-02 "Examination of Seamless, Gas Filled, Steel Pressure Vessels, Using Angle Beam Ultrasonics".

(i) Each search unit used must have the appropriate frequencies (1-5 MHz) and refracted angle (45 - 75°) for the material and geometry of the cylinder that is being examined. Other angles and frequency combinations as found appropriate may be used for flaw sizing.

(ii) Each search unit must detect and display the indication from the notch on reference ring at the maximum distance to be used during the examination.

(iii) The search unit must be comprised of a transducer mounted on a plastic wedge that is designed to have continuous acoustic coupling between the search unit and the cylinder wall.

(8) UE Standardization Ring With Reference Notches (Reference Ring): The standardization ring must be prepared in accordance with specification described in ASTM E 2223-02. A separate reference ring must be prepared for each DOT specification cylinder that is being examined under this special permit. The standard reference ring must conform to the following table:

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DOT Specification	Outside Diameter (inch)	Reference Notch Depth (inch)	Reference Notch Length, Max. Width (inch)
3AAX	22	0.100	1,0.060
3AA	9-5/8	0.068	1,0.060
3AA	22	0.100	1,0.060
3T	22	0.100	1,0.060
3AX	9-5/8	0.068	1,0.060
3A	9-5/8	0.068	1,0.060

A certification statement signed by a WSL senior review technologist (SRT) must be available for all standard references at each site where retesting is performed. The certification statement must include a standard reference drawing for each size and type of cylinder. A standard reference drawing must include dimensions and the locations of each simulated defect.

(9) UE Standardization Procedure: The UE equipment must be standardized for each cylinder type by using the Standardization Ring and in accordance with procedure described in ASTM E 2223-02.

(10) UE Procedure:

(i) The UE of each cylinder must be in accordance with the ultrasonic examination described in ASTM E 2223-02 except that:

(A) The extent of the examination shall be 18 inches on either side of the axial location (on the cylindrical portion) as determined through AE.

(B) The examination shall be performed within a single "V- path" if any flaw indication exceeds 20% of DAC. For indications exceeding 20% of DAC, flaw characterization & sizing shall be performed by TOFD or other suitable technique.

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(ii) A copy of the most recent approved operating test procedure must be at each facility performing ultrasonic examination and be made available to a DOT representative when requested. Any change to the written procedures or in UE equipment (software or hardware), other than as supplied by the original equipment manufacturer, must be submitted to and approved by AAHMS prior to implementation.

(11) Rejection criteria: The rejection criteria must conform to the following table:

DOT Specification	Outside Diameter (inch)	Rejection Crack Depth (inch)
3AAX	22	≥ 0.100
3AX	22	≥ 0.100
3T	22	≥ 0.100
3AA	9-5/8	≥ 0.068
3A	9-5/8	≥ 0.068

When a cylinder is rejected, it must be suspended from service until the final decision on the disposition of the tube is decided. When a cylinder is condemned the retester must stamp a series of X's over the special permit or DOT specification number and marked test pressure, or stamp "CONDEMNED" on the shoulder, or neck using a steel stamp, and must notify the cylinder owner, in writing, that the cylinder is condemned and may not be filled with hazardous material for transportation in commerce. Alternatively, at the direction of the owner, the retester may render the cylinder incapable of holding pressure. Upon rejecting/condemning a cylinder, the same shall be informed to Associate Administrator for Hazardous Materials Safety, PHMSA along with the pertaining inspection information.

c. MARKING:

(1) The exterior of the trailer cabinet of the vehicle chassis to which the cylinders are affixed must

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be marked with letters at least 2 inches high on a contrasting background "DOT-SP 15610".

(2) An exterior tube on each side of a tube module motor vehicle trailer must be marked with letters at least 2 inches high on a contrasting background "DOT-SP 15610".

(3) The current retest date must be marked on the rear bulkhead inside the trailer cabinet at approximately eye level above the withdrawal valve for tube trailers and on the bulkhead near the withdrawal valve for tube modules. In the event retest dates of cylinders differ in a trailer cluster, the retest date displayed will be that of the oldest retest date, meaning the date of the retest that must occur first.

d. REPORT: A report must be generated for each unit listing all cylinders that were examined. The AE and UE reports must include the following:

- (1) Unit/Module/Batch control identification
- (2) AE and UE equipment, model and serial No.
- (3) Specification of the standard reference used to UE the cylinder. Standard reference (calibration ring) must be identified by serial number or other stamped identification marking
- (4) Cylinder serial number, type and stamped pressure
- (5) Maximum allowable filling pressure
- (6) Minimum prescribed sidewall
- (7) Number of events at each location
- (8) Description of each AE event (amplitude, duration, energy, etc.)
- (9) Size of each defect measured (length and depth)
- (10) Type of each defect measured (crack, pitting, etc.)
- (11) Defect location relative to each sensor
- (12) Defect angular location defined by clock direction (3, 5, or 9 O'clock)
- (13) Defect location relative to sidewall (interior, outer surface, inner surface)
- (14) AE and UE technicians' name and certification level
- (15) Test Date

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- (16) Thread inspection results (passed/failed/NA)
- (17) Internal inspection results (passed/failed/NA)
- (18) Acceptance/rejection results.

The AE and UE reports must be on file at the test site, and made available to a DOT official when requested.

- e. PERSONNEL QUALIFICATION: Each person who performs retesting or who evaluates or certifies retest results must meet the following requirements:

- (1) Project Manager - is the senior manager of WavesInSolids LLC (WSL) responsible for compliance with DOT regulations including this special permit. Additionally, the project manager must ensure that each operator and senior review technologist maintain the required certifications described herein.

- (2) The personnel responsible for performing cylinder retesting under this special permit shall be qualified to an appropriate Level (Level I, II or III)- acoustic emission and ultrasonic examination (AE/UE) in accordance with the American Society for Nondestructive Testing (ASNT) Recommended Practice SNT-TC-1A-1996 depending upon the assigned responsibility as described below:

- (i) As a minimum, a Level II Operator must perform system startup, calibrate the system, and review and certify the test results when written acceptance and rejection criteria for cylinders has been provided by a Senior Review Technologist. Based upon written criteria, the Level II Operator may authorize cylinders that pass the retest to be marked in accordance with paragraph 7(c) of this special permit. However, a person with Level I certification may perform a system startup, check calibration, and perform AE/UE under the direct guidance and supervision of a Senior Review Technologist or a Level II Operator, either of whom must be physically present at the test site so as to be able to observe examination conducted under this special permit.

- (ii) Senior Review Technologist (SRT) - is a person who provides written AE/UE procedure, supervisory training and examinations (level I and

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II), technical guidance to operators and reviews and verifies the retest results. A SRT must have a thorough understanding of the DOT Regulations (49 CFR) pertaining to the requalification and reuse of DOT cylinders authorized under this special permit and ASNT Recommended Practice SNT-TC-1A and possess either:

(A) A Level III certification from ASNT in Acoustic Emission and Ultrasonic Testing; or,

(B) A Professional Engineer (PE) License with a documented experience for a minimum of 2 years experience in Non-Destructive Evaluation (NDE) of pressure vessels or pipelines using the Acoustic Emission and ultrasonic examination techniques; or,

(C) A PhD degree in Engineering/Physics with documented evidence of experience in Non-Destructive Evaluation (NDE) of pressure vessels or pipelines using the ultrasonic examination technique or research/thesis work and authoring/co-authoring of technical papers published, in recognized technical journals, in the fields of Acoustic Emission and ultrasonic testing methods.

The SRT must prepare and submit the reports required in paragraphs 7.d. and annually verify that the UE program is being operated in accordance with the requirements of this special permit.

The most recent copies of certification (e.g. ASNT Level III or P.E. license) must be available for inspection at each requalification facility.

f. OPERATIONAL CONTROLS:

(1) No person may perform inspection and testing of cylinders subject to this special permit unless:

(i) That person is an employee of WavesInSolids LLC (WSL) and has a current copy of this special permit at the location of such inspection and testing; and

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(ii) Complies with all the terms and conditions of this special permit.

(2) The marking of the retester's symbol along with the letters AE on the cylinders (when individually tested) and/or affixing a data plate certifies compliance with all of the terms and conditions of this special permit. The data plate should at minimum include the following:

- (i) Retesting company name
- (ii) RIN
- (iii) DOT Special permit number
- (iv) Trailer/Module's identification
- (v) Filling pressure (lowest stamped working pressure) at 70°F
- (vi) Maximum allowed filling pressure including overfill if applicable at 70°F
- (vii) Test date
- (viii) Retest date
- (ix) Water capacity

(3) Each facility approved by the Approvals and Permits Division to test cylinders under the terms of this special permit must have a resident operator with at least a Level II Certification in AE/UE.

(4) In the event of retest with more than one method of retest being performed at the time of retest, the markings per 7.c. of this special permit shall be displayed only if the final method of retest is as per this special permit.

8. SPECIAL PROVISIONS:

a. The designated SRT must review the AE/UE program annually. The designated SRT must submit a letter to OHMSPA verifying that the AE/UE program is meeting the terms and requirements of this special permit.

b. Cylinders retested in accordance with paragraph 7 above may be charged to 110 percent of marked service pressure in accordance with § 173.302a(b) if one of the following criteria is satisfied:

- (1) A plus stamp (+) is found on the cylinder (tube) from the previous requalification.

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(2) The 100% of the cylinder side-wall is examined by ultrasonic examination using straight beam and ensure that area corrosion (which the remaining wall thickness is bellow the minimum design wall thickness, t_m) is less than or equal to 0.7 in².

c. The ultrasonic examination (UE) data, results, and additional technical information deemed pertinent in successful application of the UE must be recorded and kept at each facility for a minimum of 5 years after completion of UE. For any rejected cylinder, the defect causing the rejection must be fully characterized and profiled. That is, the specific type of defect should be identified (i.e. isolated pits, line corrosion or SBT crack) and the specific size of the defect should be determined (i.e. length, depth, width, diameter, area, etc.). The record includes cylinder type, size, minimum design wall thickness, age, etc. of the rejected cylinder.

d. Shippers (offerors) may use the cylinders specified and tested in accordance with the provisions of this special permit for the transportation in commerce of those hazardous materials specified herein, provided no modifications or changes are made to the cylinders. All terms of this special permit and other applicable requirements contained in 49 CFR Parts 100-185 must be met.

e. A statement of qualifications, for each "qualified AE/UE tester" used under this special permit and information in support thereof, must be maintained by WSL. The location of this statement, for each "qualified AE/UE tester", must be identified to the Approvals and Permits Division.

f. A person who is not a holder of this special permit who receives a package covered by this special permit may reoffer it for transportation provided no modifications or changes are made to the package and it is reoffered for transportation in conformance with this special permit and the HMR.

g. A current copy of this special permit must be maintained at each facility where the package is offered or reoffered for transportation.

h. Motor carriers operating under the terms of this special permit must have a "Satisfactory" or "Conditional" safety rating as prescribed in 49 CFR Part 385.

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- i. Transportation of Division 2.1 (flammable gases) and Division 2.3 (gases which are poisonous by inhalation) materials are not authorized aboard cargo vessels unless specifically authorized in the Hazardous Materials Table (§ 172.102).
9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, rail freight and cargo vessel.
10. MODAL REQUIREMENTS: A copy of this special permit, the revision per which the current retest was performed, must be carried aboard each cargo vessel or motor vehicle used to transport packages covered by this special permit.
11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this special permit and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:
- o All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.
 - o Persons operating under the terms of this special permit must comply with the security plan requirement in Subpart I of Part 172 of the HMR, when applicable.
 - o Registration required by § 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this special permit must receive training on the requirements and conditions of this special permit in addition to the training required by §§ 172.700 through 172.704.

No person may use or apply this special permit, including display of its number, when this special permit has expired or is otherwise no longer in effect.

Under Title VII of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)—"The Hazardous Materials Safety and Security Reauthorization Act of 2005" (Pub. L. 109-59), 119 Stat. 1144 (August 10, 2005), amended the Federal hazardous

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materials transportation law by changing the term "exemption" to "special permit" and authorizes a special permit to be granted up to two years for new special permits and up to four years for renewals.

12. REPORTING REQUIREMENTS: Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49 CFR §§ 171.15 Immediate notice of certain hazardous materials incidents, and 171.16 Detailed hazardous materials incident reports. In addition, the grantee(s) of this special permit must notify the Associate Administrator for Hazardous Materials Safety, in writing, of any incident involving a package, shipment or operation conducted under terms of this special permit.

Issued in Washington, D.C.:



for Dr. Magdy El-Sibaie
Associate Administrator for Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Material Safety Administration, U.S. Department of Transportation, East Building PHH-30, 1200 New Jersey Avenue, Southeast, Washington, D.C. 20590.

Copies of this special permit may be obtained by accessing the Hazardous Materials Safety Homepage at http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm. Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

PO: MOORE/TG