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SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

Vendor/Firm Name and Address
Raison sociale et adresse du fournisseur/de l'entrepreneur

Issuing Office - Bureau de distribution

Public Works and Government Services Canada - Western Region
Room 100
167 Lombard Ave.
Winnipeg
Manitoba
R3B 0T6

Title - Sujet Rheometer	
Solicitation No. - N° de l'invitation 31970-152033/A	**Amendment No. - N° modif.** 003
Client Reference No. - N° de référence du client 31970-152033	**Date** 2015-12-08
GETS Reference No. - N° de référence de SEAG PW-$WPG-080-9629	
File No. - N° de dossier WPG-5-38140 (113)	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2015-12-14**	**Time Zone** **Fuseau horaire** Central Daylight Saving Time CDT
F.O.B. - F.A.B. **Plant-Usine:** ☐ **Destination:** ☑ **Other-Autre:** ☐	
Address Enquiries to: - Adresser toutes questions à: Chubey, Karen	**Buyer Id - Id de l'acheteur** wpg113
Telephone No. - N° de téléphone (204) 291-5928 ( )	**FAX No. - N° de FAX** (204) 983-7796
Destination - of Goods, Services, and Construction: **Destination - des biens, services et construction:**	

Instructions: See Herein

Instructions: Voir aux présentes

Delivery Required - Livraison exigée	**Delivery Offered - Livraison proposée**
Vendor/Firm Name and Address **Raison sociale et adresse du fournisseur/de l'entrepreneur** **Telephone No. - N° de téléphone** **Facsimile No. - N° de télécopieur**	
Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) **Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)** **Signature** **Date**	

Canada

Rheometer

Amendment No. 003 is raised to amend the Solicitation as follows:

1) Amendment 003 is raised to amend the closing date as follows:

DELETE: Solicitation Closing Date to December 10, 2015 Central Standard Time.

INSERT: Solicitation Closing Date to December 14, 2015 Central Standard Time.

2) Amendment 003 is raised to amend Annex A Criteria (reference Description and Status column):

DELETE: Annex A Requirement in its entirety

INSERT: Annex A Requirement (see below)

REQUIREMENT

STATUS:

M = **Mandatory Criteria**;
To be considered responsive, a bid must meet **all** of the **mandatory** criteria at **BID CLOSING.** Bidders must demonstrate their ability to meet those requirements. The proposals will be evaluated on the basis of the following criteria, therefore, Bidders are advised to address each area in sufficient depth to show compliance. Proposals which do not give sufficient information will be considered to be non-responsive. Failure by Bidders to meet the mandatory requirements will render the Bidder's proposal non-responsive and will be given no further consideration in the evaluation process.

O = **Optional Criteria**;

I = **Information only**;
Bidders must meet these requirements /specifications , but it is not mandatory for Bidder's to demonstrate their ability to meet these requirements at bid closing.

D = **Desirable Criteria**
Desirable criteria are performance or characteristic features that are considered ideal to have, but are not mandatory and will only be used where there is identical low bids.

What's Expected in Bidder's Proposal for all items with "M" Status:
Technical information, photos, and/or brochures must be submitted with the Bidder's proposal at solicitation close, to clearly demonstrate Bidder's compliance with the specifications detailed within this solicitation. In the event that the published documentation does not demonstrate compliance, a written narrative demonstrating compliance will be accepted.

Bidder's Cross Reference and/or Response (SIR):
In this column, Bidder is to cross-reference where this technical specification is indicated in their brochure, technical data sheet.
If applicable, Bidder must indicate how they meet the specifications addressed below, by recording this information in this column.

Item	Description	Status	Bidder's Cross Reference and/or Response (SUPPLEMENTAL INFORMATION REFERENCE)
A	**Main Primary Feature / Functionality Requirements**		
1.	The rheometer must be a single-head or combined motor and transducer design, and must incorporate a magnetic levitation thrust bearing, as compared to traditional air or mechanical bearings. A magnetic bearing is required because the clearance gap is on the order of 250 times larger than air bearing designs which reduces friction by 70% thereby	I	

	allowing true accurate instrument torque measurements down to 0.5 nN.m in oscillation measurements and 5 nN.m in steady shear. (Note: Instrument torque means torque applied by instrument motor uncorrected for any moment of inertia contributions). Additional requirements for the air bearing are related to reducing air consumption and a more rugged design not susceptible to costly damage from moisture or particulates which can occur in air supplied to air bearings.		
2	The rheometer must have two radial bearings along the length of the rotating shaft for maximizing radial rigidity.	I	
3	The torque motor must be a low mass drag-cup induction design with a moment of inertia of no larger than 25 $\mu N.m.s^2$. The moment of inertia reported must include all moving parts of the motor without a geometry installed. The motor must incorporate a non-contact induction temperature sensor to provide a direct measure of the temperature of the drag cup and insure absolute accurate torque control unaffected by temperature change in the drag cup. The motor must employ digital current control to avoid range switching and supply seamless torque over the entire range.	I	
4	The rheometer must be capable of applying a maximum torque of 200 mN.m. and capable of applying 200 mN.m of torque continuously in steady shear or creep mode, for a time of 15 minutes, without the need of any external fluid circulating for motor cooling.	I	
5	The rheometer must have an option for a first principle torque calibration with NIST traceability. Torque calibration with certified oil or other material is unacceptable because true first principle calibration can't be accomplished with materials affected by two degrees of freedom (temperature and torque).	I	
6	The instrument software must report absolute uncorrected torque applied by the motor (not sample torque corrected for moment of inertia) in addition to the stress applied by the motor and the inertia corrected stress actually applied to the sample.	I	
7	The step strain response time of instrument must be no longer than 15 ms to 99% of commanded value.	I	
8	The step rate response time of instrument must be no longer than 5 ms to 99% of commanded value.	I	

9	The rheometer must include an optical encoder for displacement measurements with a dual encoder reader. The optical encoder dual reader is required for obtaining angular displacement resolution down to 2 nrad and to eliminate displacement drift that occurs in encoders with single read heads.	I	
10	The rheometer must have an angular velocity range of at least 0 to 300 rad/s.	M	
11	The rheometer must have a frequency range in oscillation mode of at least 1.E-7 to 100 Hz (7.5E-7 to 628 rad/s).	M	
12	The rheometer must include the ability to control and measure normal forces using a force rebalance transducer over a force range of at least 0.005 to 50 N.	M	
13	During any test the normal force on the sample [compression or tension] can be kept within defined limits. In addition during temperature sweeps or ramps the gap must automatically adjust for thermal expansion/contraction of the measurement plates by actual movement of the geometry as long as the normal force control limits are not violated. Software gap correction for parallel plates must be invoked if the limits have been reached.	I	
14	The rheometer must include a position sensor at the base of the rheometer head capable of making real-time corrections for the effects of thermal expansion/contraction of the rheometer shaft, in addition to active gap-temperature compensation capabilities to adjust for geometry expansion/contraction. The position sensor and gap-temperature compensation must work together yet independently and not place any restrictions on geometry or temperature system selection or their temperature ranges. Any gap compensation must be accomplished by physically moving the rheometer head as opposed to passive adjustments to calculated gap. The latter allows sample to be squeezed out of plates on heating or shrinkages of sample away from plate testing surface on cooling. This feature is required to insure the most accurate gap possible under any possible testing conditions of wide torque and/or temperature swings.	D	
15	The rheometer must have primary testing station and power	D	

	supply and main electronics housed in a separate enclosure. This requirement insures the data generated is unaffected by heat generated by electronics and vibrations from electronic cooling fans. It is necessary to have this architecture to truly have torque measurements down to 0.5 nN.m, as on-board vibrations will generate torques in excess of this level. This architecture also gives greater flexibility with maximizing bench space as the electronics box can be placed on the floor or on a shelf on the wall.		
16	The rheometer must be constructed on a solid cast single-piece frame to reduce compliance as much as possible which needs to be corrected and can impact absolute instrument measureable ranges. The rheometer must have an axial compliance of no more than 0.28 μm/N and a radial compliance of no more than 0.7 μrad/N.m.	D	
17	The rheometer must include a parameter display and control panel on the test station for performing the following functions: raise and lowering head, gap zero, sample loading with trim gap pause, electronic trim lock, temperature system interchange, and experiment start/stop.	M	
18	The rheometer must include both automatic temperature system and geometry recognition to minimize operator time and eliminate potential mistakes with configurations and test set-up. All interchangeable temperature systems and accessories must be powered by the main instrument electronics and NOT by additional power and electronics boxes which take up valuable laboratory bench space.	D	
19	The instrument software must report both raw phase angle and corrected phase angle for oscillation measurements for validation of data quality. Viewing these signals enable full understanding of the effect of moment of inertia on measured data for acceptance.	M	
20	The rheometer must include a “drawrod” geometry connection because this method minimizes any moment of inertia typical of bulky connectors with large radii. In addition, the rheometer must have the ability to use a modified drawrod with an embedded Platinum resistance thermocouple and non-contact signal transfer capability, which can be used to control and measure the upper plate temperature for upper non-contact	D	

	heating systems. Because the requested rheometer is a single head design, no contact can be made with the system because it will interfere with the torque/displacement signals. The ability to actually control and measure both top and bottom plate temperatures has the following advantages: faster temperature response, true temperature ramps because top and bottom plates heat at the same rate, and elimination of offset calibration tables for upper heater.		
21	The rheometer must allow for the gap to be closed in the following ways: user defined velocity; user defined exponential decay, and user defined normal force. The speed of gap closure must be continuously variable.	D	
22	The rheometer system must display the oscillation waveforms real-time and store the waveform for each data point. The waveform must be viewable in order to provide an indication of the amount of noise, slip, or inertial correction for each point.	D	
23	The rheometer must include full large amplitude oscillatory shear, or LAOS, testing capability. This includes the ability to collect correlated and transient oscillatory data, and a software analysis package capable of analyzing transient data and generating non-linear parameters including: G'_M, G'_L, η'_M η'_L, S, T, Q, etc.	D	
24	The rheometer must be at least capable of operating in the following modes:		
24.1	Oscillation Mode Tests: i. Torque/Stress sweep (linear or log) at single frequency i. Frequency sweep (linear or log) at single torque ii. Frequency sweep (linear or log) at single strain iii. Strain/angular displacement sweep (linear or log) at single frequency iv. Temperature sweep at single frequency/torque v. Superimposed stress oscillation and steady shear vi. Superimposed strain oscillation and steady shear vii. Multiple simultaneous frequencies superimposed on above modes	M	
24.2	Flow Mode Tests: i. Controlled stress or torque sweeps. ii. Controlled rate (1/s) or speed (rad/s) sweeps.	M	

	iii. Stress stepped flow. iv. Equilibrium stress stepped flow (ensures material has time to respond to each level of stress). v. Temperature sweeps at constant stress or rate. vi. Squeeze flow and pull off.		
24.3	Creep Mode (transient) Tests: i. Constant stress creep and recovery. ii. Automatic sensing of steady state during creep test. iii. Stress growth	M	
24.4	Stress relaxation (transient) test	M	
24.5	The rheometer must be capable of running any of the available tests described above in one mixed procedure. In addition, while running the procedure, succeeding steps can be adapted or new steps added.	D	
25	The rheometer must correct for residual bearing friction.	D	
26	The rheometer must allow for motor and geometry inertia correction in both flow and oscillation mode, with the actual inertia measured by the instrument, not with just "book" values of inertia.	D	
27	The rheometer must automatically zero the gap.	D	
28	The rheometer must offer a large variety of testing geometries readily available to react quickly to varied testing requirements. Custom geometries must be available upon request.	D	
29	Minimum requirements for standard readily available geometries are as follows: a. Cone and/or plate diameters: 8, 20, 25, 40, 60 mm. b. Cone angles: 0.5, 1, 2, & 4° and 0.02, 0.04, & 0.1 rad c. Standard construction materials: Hard Anodized Aluminum, Stainless Steel &Titanium d. Standard Plate types: no solvent trap, solvent trap, heat break solvent trap, disposable e. Surface finishes: Sandblasted, cross hatched f. Concentric Cylinder Cups: Double Gap, Single gap, grooved g. Concentric Cylinder rotors: Conical DIN, Recessed	M	

	End, Double Gap, Vane, Helical, & propeller h. Solids testing fixtures: Torsion rectangular, Torsion Immersion i. Interfacial fixtures: Double Wall Ring, DuNouy Ring, and Bicone j. Special fixtures: SER for extensional viscosity, Quartz plate		
30	**Temperature Control System Availability.** The rheometer must include a temperature control system from -40°C to above 300 °C compatible with Peltier plates. 2 different heating system may be required, one from -40°C to 200 °C and another for temperatures >200 °C. A system for both temperature ranges may be required because systems for -40°C to 200°C give may give more accurate data within that range, while systems that can heat >200°C are less accurate but can go to much higher temperatures (i.e., up to 600°C). Also, the temperature control system must have a way of containing the sample from the external environment to eliminate/reduce the evaporation and loss of solvent during data acquisition. The rheometer temperature control system must comply with the following. All temperature control systems must include automatic recognition and compatible with position sensor. Non-contact temperature systems must include ability to actively measure and control the upper geometry directly with a PRT sensor included in the connecting draw rod.	M	
30.1	The rheometer must offer a Peltier with a temperature range of –40 °C to 200 °C , heating rates up to 20 °C/min, and a temperature accuracy of 0.1 °C. The Peltier plate must incorporate four Peltier heating elements to cover an 80 mm plate surface directly in contact with an 8 mm thick copper surface with an extremely rugged, hardened chrome surface. This design is required to provide rapid, precise, and uniform temperature control over the entire 80 mm diameter surface	M	

	allowing testing with geometries 60 mm in diameter without sacrificing horizontal temperature accuracy. The Peltier plate must be available in a stepped model with interchangeable plate material and surface finishes as well as stepped disposable model for curing samples. The Peltier plate must be capable of controlling from -20°C to 200°C using a single heat sink temperature of 1 degC. This is required because it allows uninterrupted testing over a very wide temperature range and eliminates the need for slow responding expensive computer controlled circulators. The Peltier plate must offer the following accessories: i. Solvent Trap. Solvent trap must be in contact with Peltier heating surface to and not require a separate heating system to efficiently prevent evaporation of solvents without condensation issues. ii. Purge Gas Cover: The purge gas cover allows introduction of a dry purge to prevent condensation from forming at sub ambient testing conditions or to introduce a stream of moist air to maintain some level of humidity around a specimen. iii. Insulating Thermal Cover and Insulating Solvent trap: A thermal insulation cover constructed of Anodized Aluminum surrounded by an insulating material must be available for use with Peltier Plate. The Aluminum must be in contact with surface heated by Peltier elements to pull heat around the sample to help eliminate vertical temperature gradients over moderate temperature ranges between -10°C and 80°C without the use of a separate upper heater. A		

	solvent trap version must be available for testing of samples with volatiles.		
30.2	The rheometer must offer a dual-stage Peltier plate with a temperature range of –45°C to 200 °C , heating rates up to 20 °C/min, and a temperature accuracy of 0.1 °C. The Peltier plate must be capable of controlling from -45°C to 200° C using a single heat sink temperature of 1°C. The dual stage Peltier plate must be capable of cooling to -45°C in 10 minutes. This is required because it allows testing to very low temperatures without the need for liquid nitrogen or large expensive fluid circulators and special circulation fluids.	D	
30.3	The rheometer must offer an upper heated plate system that can be used in conjunction with all Peltier plate models for use with 8, 25, and 40 mm diameter cones and plates (including disposable) and capable of a maximum temperature 150 °C. The upper heated plate must include non-contact temperature control that directly measures and controls the temperature of the upper plate and eliminate the need for temperature offset calibration tables. The geometries must be of heat spreader design to insure heat transfer is not affected by change in gap. The heating system must use an electric heating element and cooling via a cooling channel. This design allows for flexible cooling options including Peltier Circulator, Circulator, Peltier air cooling, and Vortex Cooling. When using upper heater with lower Peltier the system must match the heating rate of the Peltier plate with the upper heater to insure both plates are at the same temperature reported by the instrument. This is necessary because it eliminates guessing experiment thermal equilibration times for samples and allows for true temperature ramp control.	D	
30.4	The rheometer must offer to include a Peltier heated concentric cylinder geometry temperature system with a temperature range of –20°C to 150°C and a maximum heating rate up to 13 °C/min. The Peltier concentric cylinder system must have the following rotors available: conical DIN standard, Recessed End, Double Gap Options, propeller, vanes, and helical. The system must have available a Torsion	D	

	Immersion system for measuring solid mechanical properties under the influence of liquids under controlled temperature environments.		
30.5	The rheometer must offer an Extended Temperature Chamber, ETC temperature system with a range of -160 to 600°C and maximum heating rate of 60°C/min. This system must be a combined radiant and convection heating system for efficient heat transfer to samples. It also must be coupled with an optional mechanical air chiller system to reach sub-ambient temperatures down to -85°C. The system must offer parallel plate, cone and plate, disposable plate (for curing), torsion fixtures (for solids), and SER for extensional viscosity. The ETC temperature chamber must offer an optional camera viewer with remote illumination and focusing to easily see inside the enclosed chamber. The camera must be capable of capturing sample images over the entire temperature range of the ETC. The images must be stored with each data point taken during the experiment and viewable in the analysis software. This will allow the user to access the integrity of the sample during the experiment and provide an additional means of validating data.	D	
31	**Software Requirements.** The Instrument Operation and Analysis software must conform to the industry standard Microsoft Windows operation system. The instrument operation and basic analysis software must be native 32 bit Windows 7/XP/Vista applications. Software must be capable of multitasking, and operating multiple instruments from a single workstation. Software must comply with the following:	M	
31.1	The PC must communicate via internet protocol with the test instrument electronics.	M	
31.2	The software must offer ability to automatically update both instrument software and firmware through the Internet using an update routine. The software must be able to automatically look for updates and inform user when available.	M	
31.3	All raw data or instrument parameters must be accessible at anytime.	M	
31.4	The software must make use of Windows conventions and features such as long file names.	M	

31.5	The software must include image capture and streaming video capability that can be interfaced with a web camera through computer USB connection.	D	
31.6	Ability to run the instrument and perform other tasks simultaneously such as data analysis, Microsoft Word, or Microsoft Excel.	D	
31.7	Software must also feature true 'cut-and-paste' functionality with common Windows applications such as MSWord, MSExcel and Lotus. In addition, data export into MSExcel/ASCII and XML format must be a standard feature of the software.	D	
31.8	The data analysis package has the ability to run on any computer within the customer's organization without the use of a hardware key. This allows the user to make full use of the data analysis capability remote from computer that runs the instrument. i. Data analysis options to include the following curve modeling or analysis /transformation functions: ii. Mathematical model: straight line, onset point, modulus crossover, first and second derivative, integration, Polynomial, exponential, sine/cosine, Fourier series, iii. Flow: Newtonian, Casson, Bingham, Herschel-Buckley, Power Law, Sisko, Cross, Williamson, Ellis, Carreau, Best fit Polynomial. iv. Creep: discrete retardation spectrum, Burger model. v. Oscillation: Discrete and continuous relaxation spectrum, Spriggs, Oldroyd and Coz-Merz vi. Stress relaxation: Discrete and continuous relaxation spectrum vii. User defined model viii. Software to include transformations software transformations of G', G", G(t), J', J", J. ix. Time-Temperature Superposition, with automatic	D	

	horizontal and vertical shift. Automatically generates master curves. After fitting with WLF or Arrhenius, curves can be generated for any temperature within the range tested. Shift parameters in the scalar database other than temperature can be chosen. Shifting direction (horizontal, diagonal) can be set for the selected curves. Time/Temp Superposition capability to be built into the software package and not a third party program. x. The base software package must also include statistical analysis (column and page based) including error bar generation and data (point) editing, FFT and spline smoothing, and data reduction and page merge functions. xi. Fluid inertia corrections will be included in the software, as well as Berger's/Rabinowitch's correction. xii. Automatic determination of rheological parameters such as Zero Shear Viscosity, Plateau Modulus, Equilibrium Compliance, and Flow Activation Energy and savings in the scalar database Advanced Mw and MWD calculations based on Double Reptation theory to be available.		
32	The rheometer must offer a Solvent Traps/Evaporation Blocking Systems for Peltier plate and Peltier concentric cylinder temperature systems. The evaporation blocking system consists of a cover and solvent trap geometries which together create a thermally stable vapor barrier to eliminate solvent loss during rheological experiments.	M	
33	The rheometer to offer a tribology accessory for measuring coefficient of friction between two solid surfaces using ring on plate, ball of three plates, three ball on plate, or ball on three balls geometries.	D	
34	The rheometer must offer an immobilization cell accessory that permits the characterization of drying, retention, and immobilization kinetics of paints, coatings and slurries.	D	
B	**Other Features**		

1	Must have ability to test solid materials in dynamic bending or tension/compression modes using 3 Point-bend, Single/Dual Cantilever, Tension, Compression geometries to generate Young Modulus (E', E", and tan delta) over the entire temperature range of the Environmental Test Chamber temperature system (-150 to 600 °C).	D	
2	Immersion Cover: The immersion cover allows testing on Peltier plate with sample fully immersed in a liquid to assess the effect of the liquid on the mechanical properties of the specimen.	D	
3	Peltier Camera Accessory: An optional camera must be available for capturing an image of the sample in the geometry with every data point. This option is helpful for data validation during unattended operation.	D	
4	The rheometer must offer a sealed vessel for studying the effect of pressure on rheological properties or materials that volatilize under atmospheric pressure. Can be used to a pressure up to 138 bar (2,000 PSI) and to a maximum temperature of 150 °C.	D	

ALL OTHER TERMS AND CONDITIONS REMAIN THE SAME.