TIPS VENDOR AGREEMENT

Between Motive Wireless DBA Motive Lighting **and**

(Company Name)

THE INTERLOCAL PURCHASING SYSTEM (TIPS),

a Department of Texas Education Service Center Region 8 for

TIPS RFP 220101 Safety Equipment, Supplies and Services

General Information

The Vendor Agreement ("Agreement") made and entered into by and between The Interlocal Purchasing System (hereinafter "TIPS") a government cooperative purchasing program authorized by the Region 8 Education Service Center, having its principal place of business at 4845 US Hwy 271 North, Pittsburg, Texas 75686 and the TIPS Vendor. This Agreement consists of the provisions set forth below, including provisions of all attachments referenced herein. In the event of a conflict between the provisions set forth below and those contained in any attachment, the provisions set forth shall control unless otherwise agreed by the parties in writing and by signature and date on the attachment.

A Purchase Order ("PO"), Agreement or Contract is the TIPS Member's approval providing the authority to proceed with the negotiated delivery order under the Agreement. Special terms and conditions as agreed between the Vendor and TIPS Member should be added as addendums to the Purchase Order, Agreement or Contract. Items such as certificate of insurance, bonding requirements, small or disadvantaged business goals are some, but not all, of the possible addendums.

Terms and Conditions

Freight

All quotes to Members shall provide a line item for cost for freight or shipping regardless if there is a charge or not. If no charge for freight or shipping, indicate by stating "No Charge", "$0", "included in price" or other similar indication. Otherwise, all shipping, freight or delivery changes shall be passed through to the TIPS Member at cost with no markup and said charges shall be agreed by the TIPS Member unless alternative shipping terms are agreed by TIPS as a result of the proposal award.

Warranty Conditions

All new supplies equipment and services shall include ***manufacturer's minimum standard warranty*** unless otherwise agreed to in writing. Vendor shall be legally permitted to sell all products offered for sale to TIPS Members if the offering is included in the Request for Proposal ("RFP") category. All goods proposed and sold shall be new unless clearly stated in writing.

Customer Support

The Vendor shall provide timely and accurate customer support for orders to TIPS Members as agreed by the Parties. Vendors shall respond to such requests within a commercially reasonable time after receipt of the request. If support and/or training is a line item sold or packaged with a sale, support shall be as agreed with the TIPS Member.

Agreements
Agreements for purchase will normally be put into effect by means of a contract, agreement, or purchase order(s) executed by authorized agents of the TIPS Member participating government entities, but other means of placing an order may be used at the Member's discretion. Vendor accepts and understands that when a purchase order or similar purchase document is sent from a customer through TIPS to the Vendor, TIPS is recording the purchase and verifying whether the purchase is within the parameters of the TIPS Contract only. Vendor agrees that TIPS is not a legal party to the purchase order or similar purchase document and TIPS is not responsible for identifying fraud, mistakes, or misrepresentations for the specific order. Vendor agrees that any purchase order or similar purchase document issued from a customer to Vendor, even when processed through TIPS, constitutes a legal contract between the customer and Vendor only. A Vendor that accepts a purchase order or similar purchase document and fulfills an order, even when processed through TIPS, is representing that the vendor has carefully reviewed the purchase order or similar purchase document for legality, authenticity, and accuracy.

Tax exempt status
Most TIPS Members are tax exempt and the related laws and/or regulations of the controlling jurisdiction(s) of the TIPS Member shall apply.

Assignments of Agreements
No assignment of this Agreement may be made without the prior notification of TIPS. Written approval of TIPS shall not be unreasonably withheld. Payment for delivered goods and services can only be made to the awarded Vendor, Vendor designated reseller or vendor assigned company.

Disclosures

- Vendor and TIPS affirm that he/she, or any authorized employees or agents, has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor or service to a public servant in connection with this Agreement.

- Vendor shall attach, in writing, a complete description of any and all relationships that might be considered a conflict of interest in doing business with the TIPS program.

- The Vendor affirms that, to the best of his/her knowledge, the offer has been arrived at independently, and is submitted without collusion with anyone to obtain information or gain any favoritism that would in any way limit competition or give an unfair advantage over other vendors in the award of this Agreement.

Term of Agreement and Renewals
The Agreement with TIPS is for approximately three (3) years with an option for renewal for an additional one (1) consecutive year. If TIPS offers the renewal extension year, the Vendor will be notified by email to the primary contact of the awarded Vendor and shall be deemed accepted by the Vendor unless the awarded Vendor notifies TIPS of its objection to the additional term. TIPS may or may not exercise the available extension(s) provided in the original solicitation beyond the base three-year term. Whether or not to offer the extension is at the sole discretion of TIPS.

"Start Date" for Term Calculation Purposes Only: Regardless of actual award/effective date of Contract, for Agreement "term" calculation purposes only, the Agreement "start date" is the last day of the month that Award Notifications are anticipated as published in the Solicitation
Example: *If the anticipated award date published in the Solicitation is May 22, 2020 but extended negotiations delay award until June 27, 2020 The end date of the resulting initial "three-year" term Agreement, (which is subject to an extension(s)) will still be May 31, 2023 in this example.*

"Termination Date": The scheduled Agreement "termination date" shall be the last day of the month of the month of the Original Solicitation's Anticipated Award Date plus three years.
Example: *If the original term is approximately three years, and the solicitation provides an anticipated award date of May 22, 2020, the expiration date of the original three-year term shall be May 31, 2023 in this example.*

Extensions: Any extensions of the original term shall begin on the next day after the day the original term expires.
Example Following the Previous Example: *If TIPS offers a one-year extension, the expiration of the extended term shall be May 31, 2024* in this example.

TIPS may offer to extend Vendor Agreements to the fullest extent the original Solicitation permits.

Automatic Renewal Clauses Incorporated in Awarded Vendor Agreements with TIPS Members Resulting from the Solicitation and with the Vendor Named in this Agreement.
No Agreement for goods or services with a TIPS Member by the awarded vendor named in this Agreement that results from the solicitation award named in this Agreement, may incorporate an automatic renewal clause that exceeds month to month terms with which the TIPS Member must comply. All renewal terms incorporated in an Agreement by the vendor with the TIPS Member shall only be valid and enforceable when the vendor receives written confirmation by purchase order, executed Agreement or other written instruction issued by the TIPS Member for any renewal period. The purpose of this clause is to avoid a TIPS Member inadvertently renewing an Agreement during a period in which the governing body of the TIPS Member has not properly appropriated and budgeted the funds to satisfy the Agreement renewal. This term is not negotiable and any Agreement between a TIPS Member and a TIPS awarded vendor with an automatic renewal clause that conflicts with these terms is rendered void and unenforceable.

Shipments
The Vendor shall ship, deliver or provide ordered products or services within a commercially reasonable time after the receipt of the order from the TIPS Member. If a delay in said delivery is anticipated, the Vendor shall notify TIPS Member as to why delivery is delayed and shall provide an estimated time for completion of the order. TIPS or the requesting entity may cancel the order if estimated delivery time is not acceptable or not as agreed by the parties.

Invoices
Each invoice or pay request shall include the TIPS Member's purchase order number or other identifying designation as provided in the order by the TIPS Member. If applicable, the shipment tracking number or pertinent information for verification of TIPS Member receipt shall be made available upon request.

Payments
The TIPS Member will make payments directly to the Vendor, the Vendor Assigned Dealer or as agreed by the Vendor and the TIPS Member after receiving invoice and in compliance with applicable payment statute(s), whichever is the greater time or as otherwise provided by an agreement of the parties.

Pricing
Price increases will be honored according to the terms of the solicitation. All pricing submitted to TIPS shall include the participation fee, as provided in the solicitation, to be remitted to TIPS by the Vendor. Vendor will not show adding the fee to the invoice presented to TIPS Member customer.

Participation Fees and Reporting of Sales to TIPS by Vendor
The Participation Fee that was published as part of the Solicitation and the fee published is the legally effective fee, along with any fee conditions stated in the Solicitation. Collection of the fees by TIPS is required under Texas Government Code §791.011 Et seq. Fees are due on all TIPS purchases reported by either Vendor or Member. Fees are due to TIPS upon payment by the Member to the Vendor, Reseller or Vendor Assigned Dealer. Vendor, Reseller or Vendor Assigned Dealer agrees that the participation fee is due to TIPS for all Agreement sales immediately upon receipt of payment including partial payment, from the Member Entity and must be paid to TIPS at least on a monthly basis, specifically within 31 calendar days of receipt of payment, if not more frequently, or as otherwise agreed by TIPS in writing and signed by an authorized signatory of TIPS. Thus, when an awarded Vendor, Reseller or Vendor Assigned Dealer receives any amount of payment, even partial payment, for a TIPS sale, the legally effective fee for that amount is immediately due to TIPS from the Vendor and fees due to TIPS should be paid at least on a monthly basis, specifically within 31 calendar days of receipt of payment, if not more frequently.

Reporting of Sales to TIPS by Vendor
Vendor is required to report all sales under the TIPS contract to TIPS. When a public entity initiates a purchase with a TIPS Awarded Vendor, if the Member inquires verbally or in writing whether the Vendor holds a TIPS Contract, it is the duty of the Vendor to verify whether or not the Member is seeking a TIPS purchase. Once verified, the Vendor must include the TIPS Contract number on any communications and related sales documents exchanged with the TIPS Member entity. To report sales, the Vendor must login to the TIPS Vendor Portal online at https://www.tips-usa.com/vendors_form.cfm and click on the PO's and Payments tab. Pages 3-7 of the Vendor Portal User Guide will walk you through the process of reporting sales to TIPS. Please refer to the TIPS Accounting FAQ's for more information about reporting sales and if you have further questions, contact the Accounting Team at accounting@tips-usa.com. The Vendor or vendor assigned dealers are responsible for keeping record of all sales that go through the TIPS Agreement and submitting same to TIPS. Failure to render the participation fee to TIPS shall constitute a breach of this agreement with our parent governmental entity, Texas Education Service Center Region 8, as established by the Texas legislature and shall be grounds for termination of this agreement and any other agreement held with TIPS and possible legal action. Any overpayment of participation fees to TIPS by a Vendor will be refunded to the Vendor within ninety (90) days of receipt of notification if TIPS receives written notification of the overpayment not later than the expiration of six (6) months from the date of overpayment and TIPS determines that the amount was not legally due to TIPS pursuant to this agreement and applicable law. It is the Vendor's responsibility to identify which sales are TIPS Agreement sales and pay the correct participation fee due for TIPS Agreement sales. Any notification of overpayment received by TIPS after the expiration of six (6) months from the date of overpayment will be non-refundable. Region 8 ESC and TIPS reserve the right to extend the six (6) month deadline to notify if approved by the Region 8 ESC Board of Directors. TIPS reserves all rights under the law to collect the fees due. Please contact TIPS at tips@tips-usa.com or call (866) 839-8477 if you have questions about paying fees.

Indemnity
The Vendor agrees to indemnify and hold harmless and defend TIPS, TIPS Member(s), officers and employees from and against all claims and suits by third parties for damages, injuries to persons (including death),

property damages, losses, and expenses including court costs and reasonable attorney's fees, arising out of, or resulting from, Vendor's performance under this Agreement, including all such causes of action based upon common, constitutional, or statutory law, or based in whole or in part, upon allegations of negligent or intentional acts on the part of the Vendor, its officers, employees, agents, subcontractors, licensees, or invitees. Parties found liable shall pay their proportionate share of damages as agreed by the parties or as ordered by a court of competent jurisdiction over the case. **NO LIMITATION OF LIABILITY FOR DAMAGES FOR PERSONAL INJURY OR PROPERTY DAMAGE ARE PERMITTED OR AGREED BY TIPS/ESC REGION 8.** Per Texas Education Code §44.032(f), and pursuant to its requirements only, reasonable Attorney's fees are recoverable by the prevailing party in any dispute resulting in litigation.

State of Texas Franchise Tax
By signature hereon, the Vendor hereby certifies that he/she is not currently delinquent in the payment of any franchise taxes owed the State of Texas under Chapter 171, Tax Code.

Miscellaneous
The Vendor acknowledges and agrees that continued participation in TIPS is subject to TIPS sole discretion and that any Vendor may be removed from the participation in the Program at any time with or without cause. Nothing in the Agreement or in any other communication between TIPS and the Vendor may be construed as a guarantee that TIPS or TIPS Members will submit any orders at any time. TIPS reserves the right to request additional proposals for items or services already on Agreement at any time.

Purchase Order Pricing/Product Deviation
If a deviation of pricing/product on a Purchase Order or contract modification occurs between the Vendor and the TIPS Member, TIPS must be notified within five (5) business days of receipt of change order.

Termination for Convenience of TIPS Agreement Only
TIPS reserves the right to terminate this agreement for cause or no cause for convenience with a thirty (30) days prior written notice. Termination for convenience is conditionally required under Federal Regulations 2 CFR part 200 if the customer is using federal funds for the procurement. All purchase orders presented to the Vendor, but not fulfilled by the Vendor, by a TIPS Member prior to the actual termination of this agreement shall be honored at the option of the TIPS Member. The awarded Vendor may terminate the agreement with ninety (90) days prior written notice to TIPS 4845 US Hwy North, Pittsburg, Texas 75686. The vendor will be paid for goods and services delivered prior to the termination provided that the goods and services were delivered in accordance with the terms and conditions of the terminated agreement. This termination clause does not affect the sales agreements executed by the Vendor and the TIPS Member customer pursuant to this agreement. TIPS Members may negotiate a termination for convenience clause that meets the needs of the transaction based on applicable factors, such as funding sources or other needs.

TIPS Member Purchasing Procedures
Usually, purchase orders or their equal are issued by participating TIPS Member to the awarded vendor and should indicate on the order that the purchase is per the applicable TIPS Agreement Number. Orders are typically emailed to TIPS at tipspo@tips-usa.com.

- Awarded Vendor delivers goods/services directly to the participating member.
- Awarded Vendor invoices the participating TIPS Member directly.
- Awarded Vendor receives payment directly from the participating member.
- Fees are due to TIPS upon payment by the Member to the Vendor. Vendor agrees to pay the participation fee to TIPS for all Agreement sales upon receipt of payment including partial payment, from

the Member Entity or as otherwise agreed by TIPS in writing and signed by an authorized signatory of TIPS.

Licenses

Awarded Vendor shall maintain, in current status, all federal, state and local licenses, bonds and permits required for the operation of the business conducted by awarded Vendor. Awarded Vendor shall remain reasonably fully informed of and in compliance with all ordinances and regulations pertaining to the lawful provision of goods or services under the Agreement. TIPS and TIPS Members reserves the right to stop work and/or cancel an order or terminate this or any other sales Agreement of any awarded Vendor whose license(s) required for performance under this Agreement have expired, lapsed, are suspended or terminated subject to a 30-day cure period unless prohibited by applicable statue or regulation.

Novation

If awarded Vendor sells or transfers all assets, rights or the entire portion of the assets or rights required to perform this Agreement, a successor in interest must guarantee to perform all obligations under this Agreement. A simple change of name agreement will not change the Agreement obligations of awarded vendor. TIPS will consider Contract Assignments on a case by case basis. TIPS must be notified within five (5) business days of the transfer of assets or rights.

Site Requirements (*only when applicable to service or job*)

Cleanup: When performing work on site at a TIPS Member's property, awarded Vendor shall clean up and remove all debris and rubbish resulting from their work as required or directed by TIPS Member or as agreed by the parties. Upon completion of work, the premises shall be left in good repair and an orderly, neat, clean and unobstructed condition.

Preparation: Awarded Vendor shall not begin a project for which TIPS Member has not prepared the site, unless awarded Vendor does the preparation work at no cost, or until TIPS Member includes the cost of site preparation in a purchase order. Site preparation includes, but is not limited to: moving furniture, installing wiring for networks or power, and similar pre-installation requirements.

Registered sex offender restrictions: For work to be performed at schools, awarded Vendor agrees that no employee of a subcontractor who has been adjudicated to be a registered sex offender will perform work at any time when students are, or reasonably expected to be, present unless otherwise agreed by the TIPS Member. Awarded Vendor agrees that a violation of this condition shall be considered a material breach and may result in the cancellation of the purchase order at the TIPS Member's discretion. Awarded Vendor must identify any additional costs associated with compliance of this term. If no costs are specified, compliance with this term will be provided at no additional charge. **Safety measures:** Awarded Vendor shall take all reasonable precautions for the safety of employees on the worksite, and shall erect and properly maintain all necessary safeguards for protection of workers and the public. Awarded Vendor shall post warning signs against all hazards created by the operation and work in progress. Proper precautions shall be taken pursuant to state law and standard practices to protect workers, general public and existing structures from injury or damage.

Safety Measures

Awarded Vendor shall take all reasonable precautions for the safety of employees on the worksite, and shall erect and properly maintain all necessary safeguards for protection of workers and the public. Awarded vendor shall post warning signs against all hazards created by the operation and work in progress. Proper precautions shall be taken pursuant to state law and standard practices to protect workers, general public and existing structures from injury or damage.

Smoking

Persons working under Agreement shall adhere to the TIPS Member's or local smoking statutes, codes or policies.

Marketing

Awarded Vendor agrees to allow TIPS to use their name and logo within TIPS website, marketing materials and advertisement subject to any reasonable restrictions provided to TIPS in the Proposal to the Solicitation. The Vendor may submit an acceptable use directive for Vendor's names and logos with which TIPS agrees to comply. Any use of TIPS name and logo or any form of publicity, inclusive of press release, regarding this Agreement by awarded vendor must have prior approval from TIPS which will not be unreasonably withheld. Request may be made by email to TIPS@TIPS-USA.COM.

Supplemental Agreements

The TIPS Member entity participating in the TIPS Agreement and awarded Vendor may enter into a separate Supplemental Agreement or contract to further define the level of service requirements over and above the minimum defined in this Agreement such as but not limited to, invoice requirements, ordering requirements, specialized delivery, etc. Any Supplemental Agreement or contract developed as a result of this Agreement is exclusively between the TIPS Member entity customer and the Vendor. TIPS, its agents, TIPS Members and employees not a party to the Supplemental Agreement with the TIPS Member customer, shall not be made party to any claim for breach of such agreement unless named and agreed by the Party in question in writing in the agreement. If a Vendor submitting a Proposal requires TIPS and/or TIPS Member to sign an additional agreement, those agreements shall comply with the award made by TIPS to the Vendor. Supplemental Vendor's Agreement documents may not become part of TIPS' Agreement with Vendor unless and until an authorized representative of TIPS reviews and approves it. TIPS review and approval may be at any time during the life of this Vendor Agreement. TIPS permits TIPS Members to negotiate additional terms and conditions with the Vendor for the provision of goods or services under the Vendor's TIPS Agreement so long as they do not materially conflict with this Agreement.

Survival Clause

All applicable sales, leases, Supplemental Agreements, contracts, software license agreements, warranties or service agreements that were entered into between Vendor and TIPS or the TIPS Member Customer under the terms and conditions of this Agreement shall survive the expiration or termination of this Agreement. All Orders, Purchase Orders issued or contracts executed by TIPS or a TIPS Member and accepted by the Vendor prior to the expiration or termination of this agreement, shall survive expiration or termination of the Agreement, subject to previously agreed terms and conditions agreed by the parties or as otherwise specified herein relating to termination of this agreement.

Legal obligations

It is the responding Vendor's responsibility to be aware of and comply with all local, state and federal laws governing the sale of products/services identified in the applicable Solicitation that resulted in this Vendor Agreement and any awarded Agreement thereof. Applicable laws and regulations must be followed even if not specifically identified herein.

Audit rights

Due to transparency statutes and public accountability requirements of TIPS and TIPS Members', the awarded Vendor shall, at their sole expense, maintain appropriate due diligence of all purchases made by TIPS Member that utilizes this Agreement. TIPS and Region 8 ESC each reserve the right to audit the accounting of TIPS related purchases for a period of three (3) years from the time such purchases are made. This audit right shall survive termination of this Agreement for a period of one (1) year from the effective

date of termination. In order to ensure and confirm compliance with this agreement, TIPS shall have authority to conduct audits of Awarded Vendor's pricing or TIPS transaction documentation with TIPS Members with 30 days' notice unless the audit is ordered by a Court Order or by a Government Agency with authority to do so without notice. Notwithstanding the foregoing, in the event that TIPS is made aware of any pricing being offered to eligible entities that is materially inconsistent with the pricing under this agreement, TIPS shall have the ability to conduct the audit internally or may engage a third- party auditing firm to investigate any possible non- compliant conduct or may terminate the Agreement according to the terms of this Agreement. In the event of an audit, the requested materials shall be reasonably provided in the time, format and at the location acceptable to Region 8 ESC or TIPS. TIPS agrees not to perform a random audit the TIPS transaction documentation more than once per calendar year, but reserves the right to audit for just cause or as required by any governmental agency or court with regulatory authority over TIPS or the TIPS Member.

Force Majeure

If by reason of Force Majeure, either party hereto shall be rendered unable wholly or in part to carry out its obligations under this Agreement then such party shall give notice and full particulars of Force Majeure in writing to the other party within a reasonable time after occurrence of the event or cause relied upon, and the obligation of the party giving such notice, so far as it is affected by such Force Majeure, shall be suspended during the continuance of the inability then claimed, except as hereinafter provided, but for no longer period, and such party shall endeavor to remove or overcome such inability with all reasonable dispatch.

Choice of Law

The Agreement between the Vendor and TIPS/ESC Region 8 and any addenda or other additions resulting from this procurement process, however described, shall be governed by, construed and enforced in accordance with the laws of the State of Texas, regardless of any conflict of laws principles.

Venue, Jurisdiction and Service of Process

Any Proceeding arising out of or relating to this procurement process or any contract issued by TIPS resulting from or any contemplated transaction shall be brought in a court of competent jurisdiction in Camp County, Texas and each of the parties irrevocably submits to the exclusive jurisdiction of said court in any such proceeding, waives any objection it may now or hereafter have to venue or to convenience of forum, agrees that all claims in respect of the Proceeding shall be heard and determined only in any such court, and agrees not to bring any proceeding arising out of or relating to this procurement process or any contract resulting from or any contemplated transaction in any other court. The parties agree that either or both of them may file a copy of this paragraph with any court as written evidence of the knowing, voluntary and freely bargained for agreement between the parties irrevocably to waive any objections to venue or to convenience of forum. Process in any Proceeding referred to in the first sentence of this Section may be served on any party anywhere in the world. Venue for any dispute resolution process, other than litigation, between TIPS and the Vendor shall be located in Camp or Titus County, Texas.

Project Delivery Order Procedures

The TIPS Member having approved and signed an interlocal agreement, or other TIPS Membership document, may make a request of the awarded Vendor under this Agreement when the TIPS Member desires goods or services awarded to the Vendor. Notification may occur via phone, the web, courier, email, fax, or in person. Upon notification of a pending request, the awarded Vendor shall acknowledge the TIPS Member's request as soon as possible, but must make contact with the TIPS Member within two working days.

Status of TIPS Members as Related to This Agreement
TIPS Members stand in the place of TIPS as related to this agreement and have the same access to the proposal information and all related documents. TIPS Members have all the same rights under the awarded Agreement as TIPS.

Vendor's Resellers as Related to This Agreement
Vendor's Named Resellers ("Resellers") under this Agreement shall comply with all terms and conditions of this agreement and all addenda or incorporated documents. All actions related to sales by Authorized Vendor's Resellers under this Agreement are the responsibility of the awarded Vendor. If Resellers fail to report sales to TIPS under your Agreement, the awarded Vendor is responsible for their contractual failures and shall be billed for the fees. The awarded Vendor may then recover the fees from their named reseller.

Support Requirements
If there is a dispute between the awarded Vendor and TIPS Member, TIPS or its representatives may, at TIPS sole discretion, assist in conflict resolution if requested by either party. TIPS, or its representatives, reserves the right to inspect any project and audit the awarded Vendor's TIPS project files, documentation and correspondence related to the requesting TIPS Member's order. If there are confidentiality requirements by either party, TIPS shall comply to the extent permitted by law.

Incorporation of Solicitation
The TIPS Solicitation which resulted in this Vendor Agreement, whether a Request for Proposals, the Request for Competitive Sealed Proposals or Request for Qualifications solicitation, or other, the Vendor's response to same and all associated documents and forms made part of the solicitation process, including any addenda, are hereby incorporated by reference into this Agreement as if copied verbatim.

SECTION HEADERS OR TITLES
THE SECTON HEADERS OR TITLES WITHIN THIS DOCUMENT ARE MERELY GUIDES FOR CONVENIENCE AND ARE NOT FOR CLASSIFICATION OR LIMITING OF THE RESPONSIBILITES OF THE PARTIES TO THIS DOCUMENT.

STATUTORY REQUIREMENTS
Texas governmental entities are prohibited from doing business with companies that fail to certify to this condition as required by Texas Government Code Sec. 2270.

By executing this agreement, you certify that you are authorized to bind the undersigned Vendor and that your company (1) does not boycott Israel; and (2) will not boycott Israel during the term of the Agreement.

You certify that your company is not listed on and does not and will not do business with companies that are on the Texas Comptroller of Public Accounts list of Designated Foreign Terrorists Organizations per Texas Gov't Code 2270.0153 found at https://comptroller.texas.gov/purchasing/docs/foreign-terrorist.pdf

You certify that if the certified statements above become untrue at any time during the life of this Agreement that the Vendor will notify TIPS within three (3) business day of the change by a letter on Vendor's letterhead from and signed by an authorized representative of the Vendor stating the non-compliance decision and the TIPS Agreement number and description at:

Attention: General Counsel

ESC Region 8/The Interlocal Purchasing System (TIPS)
4845 Highway 271 North
Pittsburg, TX,75686
And by an email sent to bids@tips-usa.com

Insurance Requirements

The undersigned Vendor agrees to maintain the below minimum insurance requirements for TIPS Contract Holders:

General Liability	$1,000,000 each Occurrence/ Aggregate
Automobile Liability	$300,000 Includes owned, hired & non-owned
Workers' Compensation	Statutory limits for the jurisdiction in which the Vendor performs under this Agreement.
Umbrella Liability	$1,000,000

When the Vendor or its subcontractors are liable for any damages or claims, the Vendor's policy, when the Vendor is responsible for the claim, must be primary over any other valid and collectible insurance carried by the Member. Any immunity available to TIPS or TIPS Members shall not be used as a defense by the contractor's insurance policy. The coverages and limits are to be considered minimum requirements and in no way limit the liability of the Vendor(s). Insurance shall be written by a carrier with an A-; VII or better rating in accordance with current A.M. Best Key Rating Guide. Only deductibles applicable to property damage are acceptable, unless proof of retention funds to cover said deductibles is provided. "Claims made" policies will not be accepted. Vendor's required minimum coverage shall not be suspended, voided, cancelled, non-renewed or reduced in coverage or in limits unless replaced by a policy that provides the minimum required coverage except after thirty (30) days prior written notice by certified mail, return receipt requested has been given to TIPS or the TIPS Member if a project or pending delivery of an order is ongoing. Upon request, certified copies of all insurance policies shall be furnished to the TIPS or the TIPS Member.

Special Terms and Conditions

- **Orders:** All Vendor orders received from TIPS Members must be emailed to TIPS at tipspo@tips-usa.com. Should a TIPS Member send an order directly to the Vendor, it is the Vendor's responsibility to forward a copy of the order to TIPS at the email above within 3 business days and confirm its receipt with TIPS.
- **Vendor Encouraging Members to bypass TIPS agreement:** Encouraging TIPS Members to purchase directly from the Vendor or through another agreement, when the Member has requested using the TIPS cooperative Agreement or price, and thereby bypassing the TIPS Agreement is a violation of the terms and conditions of this Agreement and will result in removal of the Vendor from the TIPS Program.
- **Order Confirmation**: All TIPS Member Agreement orders are approved daily by TIPS and sent to the Vendor. The Vendor should confirm receipt of orders to the TIPS Member (customer) within 3 business days.
- **Vendor custom website for TIPS**: If Vendor is hosting a custom TIPS website, updated pricing when effective. TIPS shall be notified when prices change in accordance with the award.
- **Back Ordered Products**: If product is not expected to ship within the time provided to the TIPS

Member by the Vendor, the Member is to be notified within 3 business days and appropriate action taken based on customer request.

The TIPS Vendor Agreement Signature Page is inserted here.

TIPS Vendor Agreement Signature Form

RFP 220101 Safety Equipment, Supplies and Services

Company Name Motive Wireless DBA Motive Lighting

Address 5781 Westheimer Rd Floor 10

City Houston State TX Zip 77057

Phone 884.766.8483 Fax

Email of Authorized Representative Marquis@motivelighting.com

Name of Authorized Representative Marquis Wallace

Title Business Development

Signature of Authorized Representative

Date 02/17/2022

TIPS Authorized Representative Name David Fitts

Title Executive Director

TIPS Authorized Representative Signature David Wayne Fitts

Approved by ESC Region 8 David Wayne Fitts

Date 3/24/2022

NOTICE TO MEMBERS REGARDING ATTRIBUTE RESPONSES

TIPS VENDORS RESPOND TO ATTRIBUTE QUESTIONS AS PART OF TIPS COMPETITIVE SOLICITATION PROCESS. THE VENDOR'S RESPONSES TO ATTRIBUTE QUESTIONS ARE INCLUDED HEREIN AS "SUPPLIER RESPONSE." PLEASE BE ADVISED THAT DEVIATIONS, IF ANY, IN VENDOR'S RESPONSE TO ATTRIBUTE QUESTIONS MAY NOT REFLECT VENDOR'S FINAL ATTRIBUTE RESPONSE, WHICH IS SUBJECT TO NEGOTIATIONS PRIOR TO AWARD. PLEASE CONTACT THE TIPS OFFICE AT 866-839-8477 WITH QUESTIONS OR CONCERNS REGARDING VENDOR ATTRIBUTE RESPONSE DEVIATIONS. PLEASE KEEP IN MIND THAT TIPS DOES NOT PROVIDE LEGAL COUNSEL TO MEMBERS. TIPS RECOMMENDS THAT YOU CONSULT YOUR LEGAL COUNSEL WHEN EXECUTING CONTRACTS WITH OR MAKING PURCHASES FROM TIPS VENDORS.

220101
Motive Lighting
Motive Wireless
Supplier Response

Event Information

Number: 220101
Title: Safety Equipment, Supplies and Services
Type: Request for Proposal
Issue Date: 1/6/2022
Deadline: 2/18/2022 03:00 PM (CT)
Notes: **IF YOU CURRENTLY HOLD TIPS CONTRACT 190101 SAFETY EQUIPMENT, SUPPLIES AND SERVICES ("190101"), YOU MUST RESPOND TO THIS SOLICITATION TO PREVENT LAPSE OF CONTRACT UNLESS YOU HOLD ANOTHER CURRENT TIPS CONTRACT THAT COVERS ALL OF YOUR SAFETY OFFERINGS . THIS AWARDED CONTRACT WILL REPLACE YOUR EXPIRING TIPS CONTRACT 190101.**

IF YOU HOLD ANOTHER TIPS CONTRACT OTHER THAN 190101 WHICH COVERS ALL OF YOUR SAFETY OFFERINGS AND YOU ARE SATISFIED WITH IT, THERE IS NO NEED TO RESPOND TO THIS CONTRACT UNLESS YOU PREFER TO HOLD BOTH CONTRACTS.

Contact Information

Address: Region 8 Education Service Center
4845 US Highway 271 North
Pittsburg, TX 75686
Phone: +1 (866) 839-8477
Email: bids@tips-usa.com

Motive Lighting Information

Contact:	Marquis Wallace or John Ferraro
Address:	5718 Westheimer Rd Floor 10 Houston, TX 77057
Phone:	(844) 766-8483
Toll Free:	(844) 766-8483
Email:	Info@motivelighting.com
Web Address:	www.motivelighting.com

By submitting your response, you certify that you are authorized to represent and bind your company.

Marquis Wallace
Signature

Marquis@motivelighting.com
Email

Submitted at 2/17/2022 11:01:56 PM

Supplier Note

Please feel free to contact us as we are the only product that has been proven and tested to eliminate COVID, Bacteria and Virus, Mold with occupants in the room.

Requested Attachments

Agreement Signature Form

Tips vendor agreement signature form.pdf

If you have not taken exception or deviation to the agreement language in the solicitation attributes, download the AGREEMENT SIGNATURE FORM from the "ATTACHMENTS" tab. This PDF document is a fillable form. Download the document to your computer, fill in the requested company information, print the file, SIGN the form, SCAN the completed and signed AGREEMENT SIGNATURE FORM, and upload here.

If you have taken exception to any of the agreement language and noted the exception in the deviations section of the attributes for the agreement, complete the AGREEMENT SIGNATURE FORM, but DO NOT SIGN until those deviations have been negotiated and resolved with TIPS management. Upload the unsigned form here, because this is a required document.

All Other Certificates

Test Results and certificate covid Motive Lighting Product White Paper.edited - 1 (1).pdf

All Other Certificates (if applicable) must be scanned and uploaded. If vendor has more than one other certification scan into one document. (PDF Format ONLY)
DO NOT UPLOAD encrypted or password protected files.

Pricing Form 2

TIPS FORM 2 .xlsx

The vendor must download the PRICING SPREADSHEET SHEET from the attachment tab, fill in the requested information and upload the completed spreadsheet.
DO NOT UPLOAD encrypted or password protected files.

Reference Form

TIPS Reference_Form (2) (1).xls

The vendor must download the References spreadsheet from the attachment tab, fill in the requested information and upload the completed spreadsheet. DO NOT UPLOAD encrypted or password protected files.

Conflict of Interest Form CIQ- ONLY REQUIRED IF A CONFLICT EXISTS PER THE INSTRUCTIONS

TIPS RFP CIQ.pdf

ONLY REQUIRED IF A CONFLICT EXISTS PER THE INSTRUCTIONS
Conflict of Interest Form for Vendors that are required to submit the form. The Conflict of Interest Form is included in the Base documents or can be found at https://www.tips-usa.com/assets/documents/docs/CIQ.pdf.

Proposed Goods and Services

TIPS Product List.pdf

Please upload one or more documents or sheets describing your offerings, line cards, catalogs, links to offerings OR list links to your offerings that illustrate the catalog of proposed lines of goods and or services you carry and offer under this proposal. It does not have to be exhaustive but should, at a minimum tell us what you are offering. It could be as simple as a sheet with your link to your online catalog of goods and services.

D/M/WBE Certification OPTIONAL

MBE.pdf

D/M/WBE Certification documentation may be scanned and uploaded if you desire to claim your status as one of the identified enterprises. (Disadvantaged Business Enterprise, Minority Business Enterprise and/or Woman Business Enterprise) If vendor has more than one certification scan into one document. (PDF Format ONLY)
DO NOT UPLOAD encrypted or password protected files.

Warranty

Warranty Tips.pdf

Warranty information (if applicable) must be scanned and uploaded. (PDF Format ONLY)
DO NOT UPLOAD encrypted or password protected files.

Vendor Agreement

TTIPS VENDOR AGREEMENT.pdf

The vendor must download the Vendor Agreement from the attachment tab, fill in the requested information and upload the completed agreement.
DO NOT UPLOAD encrypted or password protected files.

Pricing Form 1

Final TIPS Pricing Form 1 (1) (1).xlsx

The vendor must download the PRICING SPREADSHEET SHEET from the attachment tab, fill in the requested information and upload the completed spreadsheet.
DO NOT UPLOAD encrypted or password protected files.

Supplementary

TIPS Product info.testRFP upload.pdf

Supplementary information may be scanned and uploaded. (Company information, brochures, catalogs, etc.) (PDF Format ONLY)
DO NOT UPLOAD encrypted or password protected files.

Logo and Other Company Marks

No response

If you desire, please upload your company logo to be added to your individual profile page on the TIPS website. If any particular specifications are required for use of your company logo, please upload that information under the Supplementary section or another non-required section under the “Response Attachment” tab. Preferred Logo Format: 300 x 225 px - .png, .eps, .jpeg preferred

Certification of Corporate Offerer Form- COMPLETE ONLY IF OFFERER IS A CORPORATION

No response

COMPLETE AND UPLOAD FORM IN ATTACHMENTS SECTION ONLY IF OFFERER IS A CORPORATION

Disclosure of Lobbying Activities Standard Form LLL

No response

ONLY IF you answered "I HAVE Lobbied per above" to attribute #66, please download and complete and upload the Standard Form-LLL, “disclosure Form to Report Lobbying,” in the Response attachments section.

Confidentiality Claim Form

TIPS_CONFIDENTIALITY_CLAIM_FORM_(1)_(1) (1).pdf

REQUIRED CONFIDENTIALITY FORM. Complete the form according to your company requirements, make any desired attachments and upload to the appropriate section under "Response Attachments" THIS FORM DETERMINES HOW ESC8/TIPS RESPONDS TO LEGAL PUBLIC INFORMATION REQUESTS.

Current W-9 Tax Form

TIPS W9 111 (1).pdf

You are required by TIPS to upload a current W-9 Internal Revenue Service (IRS) Tax Form for your entity. This form will be utilized by TIPS to properly identify your entity.

Response Attachments

MBE.pdf

MBE Certification

Proof of Motive Texas HUB.png

Motive Wireless DBA Motive Lighting Texas Hub

TIPS CONFIDENTIALITY CLAIM FORM (1) (1).pdf

TIPS Confidentiality form

TIPS RFP 1.pdf

Details and Science behind the product including rates in which we eliminate COVID(All strands) while students are in the room and other harmful components

Bid Attributes

1	**Yes - No** Disadvantaged/Minority/Women Business Enterprise - D/M/WBE/Federal HUBZone (Required by some participating governmental entities). Vendor certifies that their firm is a D/M/WBE or HUBZone? Vendor must upload proof of certification to the ”Response Attachments” D/M/WBE CERTIFICATES section. NO
2	**Yes - No** Historically Underutilized Business - HUB (Required by some participating governmental entities) Vendor certifies that their firm is a HUB as defined by the State of Texas at https://comptroller.texas.gov/purchasing/vendor/hub/. Proof may be submitted. Vendor must upload proof of certification to the “Response Attachments” HUB CERTIFICATES section. Yes
3	**Yes - No** The Vendor can provide services and/or products to all 50 US States? Yes
4	**States Served:** If answer is NO to question #3, please list which states can be served. (Example: AR, OK, TX) *No response*
5	**Company and/or Product Description:** This information will appear on the TIPS website in the company profile section, if awarded a TIPS contract. (Limit 750 characters.) Motive Lighting Provides Patent approved, and lab tested Continues Surface and Air Disinfection products. Over 99% effective against Virus, Bacteria and Mold Including COVID. Our product is safe to use with occupants in the room with very minimal Maintenace. Motive Lighting offers a complete solution that can help kids return to normalcy. This is one of a kind Made in the USA Patent approved technology.
6	**Primary Contact Name** Primary Contact Name Marquis Wallace
7	**Primary Contact Title** Primary Contact Title Business Development

8 **Primary Contact Email**

Primary Contact Email

info@motivelighting.com

9 **Primary Contact Phone**

Enter 10 digit phone number. (No dashes or extensions)
Example: 8668398477

8447668483

10 **Primary Contact Fax**

Enter 10 digit phone number. (No dashes or extensions)
Example: 8668398477

No response

11 **Primary Contact Mobile**

Enter 10 digit phone number. (No dashes or extensions)
Example: 8668398477

2144150525

12 **Secondary Contact Name**

Secondary Contact Name

John Ferraro

13 **Secondary Contact Title**

Secondary Contact Title

Business Development

14 **Secondary Contact Email**

Secondary Contact Email

John@motivelighting.com

15 **Secondary Contact Phone**

Enter 10 digit phone number. (No dashes or extensions)
Example: 8668398477

7138280203

16 **Secondary Contact Fax**

Enter 10 digit phone number. (No dashes or extensions)
Example: 8668398477

No response

17 **Secondary Contact Mobile**

Enter 10 digit phone number. (No dashes or extensions)
Example: 8668398477

No response

18 **Admin Fee Contact Name**

Admin Fee Contact Name. This person is responsible for paying the admin fee to TIPS.

Front Office

19 **Admin Fee Contact Email**

Admin Fee Contact Email

info@motivelighting.com

20 **Admin Fee Contact Phone**

Enter 10 digit phone number. (No dashes or extensions)
Example: 8668398477

2144150525

21 **Purchase Order Contact Name**

Purchase Order Contact Name. This person is responsible for receiving Purchase Orders from TIPS.

Marquis Wallace

22 **Purchase Order Contact Email**

Purchase Order Contact Email

info@motivelighting.com

23 **Purchase Order Contact Phone**

Enter 10 digit phone number. (No dashes or extensions)
Example: 8668398477

8447668483

24 **Company Website**

Company Website (Format - www.company.com)

https://motivelighting.com/home/

25 **Entity D/B/A's and Assumed Names**

Please identify all of your entity's assumed names and D/B/A's. Please note that you will be identified publicly by the legal name under which you responded to this solicitation unless you organize otherwise with TIPS after award.

Motive Lighting

26 **Primary Address**

Primary Address

5718 Westheimer Rd Floor 10

27 **Primary Address City**

Primary Address City

Houston

28 **Primary Address State**

Primary Address State (2 Digit Abbreviation)

TX

29 **Primary Address Zip**

Primary Address Zip

77057

30 **Search Words:**

Please list search words to be posted in the TIPS database about your company that TIPS website users might search. Words may be product names, manufacturers, or other words associated with the category of award. YOU MAY NOT LIST NON-CATEGORY ITEMS. (Limit 500 words) (Format: product, paper, construction, manufacturer name, etc.)

Indoor Air Quality, COVID, Air Purifier, Air Filter, UVC, UVGI, Heppa, surface disinfection, Bacteria, Virus, Mold Clean

31 **Do you want TIPS Members to be able to spend Federal grant funds with you if awarded? Is it your intent to be able to sell to our members regardless of the fund source, whether it be local, state or federal?**

Most of our members receive Federal Government grants or other funding and they make up a significant portion of their budgets. The Members need to know if your company is willing to sell to them when they spend federal budget funds on their purchase. There are attributes that follow that include provisions from the federal regulations in 2 CFR part 200, etc. Your answers will determine if your award will be designated as eligible for TIPS Members to utilize federal funds with your company.

Do you want TIPS Members to be able to spend Federal funds, at the Member's discretion, with you?

Yes

32 **Yes - No**

Certification of Residency (Required by the State of Texas) The vendor's ultimate parent company or majority owner:

(A) has its principal place of business in Texas;

OR

(B) employs at least 500 persons in Texas?

This question is required as a data gathering function for information to our members making purchases with awarded vendors. It does not affect scoring with TIPS.

Yes

33 **Company Residence (City)**

Vendor's principal place of business is in the city of?

Houston

34 **Company Residence (State)**

Vendor's principal place of business is in the state of?

Texas

35 **Discount Offered - CAUTION READ CAREFULLY BECAUSE VENDORS FREQUENTLY MAKE MISTAKES ON THIS ATTRIBUTE QUESTION**

Remember this is a ***MINIMUM*** discount percentage. So, be sure that the discount percentage inserted here can be applied to ANY OFFERING OF GOODS OR SERVICES THROUGHOUT THE LIFE OF THE CONTRACT.

CAUTION: BE CERTAIN YOU CAN HONOR THIS ***MINIMUM*** DISCOUNT PERCENTAGE ON ANY OFFERED SERVICE OR GOOD NOW OR DURING THE LIFE OF THE CONTRACT.

What is the ***MINIMUM*** percentage discount off of any item or service you offer to TIPS Members that is in your regular catalog (as defined in the solicitation specifications document), website, store or shelf pricing or when adding new goods or services to your offerings during the life of the contract? The resulting price of any goods or services Catalog list prices after this discount is applied is a ceiling on your pricing and not a floor because, in order to be more competitive in the individual circumstance, you may offer a larger discount depending on the items or services purchased and the quantity at time of sale. Please note that any specific greater discount offered for a particular product, brand, or service listed in Vendor's proposal will control and Vendor will be required to honor that greater specific discount, in excess of the minimum discount, for that particular product, brand, or service for the life of the contract.

Must answer with a number between 0% and 100%.

3%

36 **MINIMUM Discount Term**

Does the vendor agree to at least offer, for the life of the Agreement, the Minimum Discount Percentage off list or catalog proposed by Vendor in response to the Attribute entitled "Discount Offered - CAUTION READ CAREFULLY BECAUSE VENDORS FREQUENTLY MAKE MISTAKES ON THIS ATTRIBUTE QUESTION"? TIPS will utilize this response to satisfy the Long Term Cost scoring evaluation criteria. A "YES" answer will be awarded the maximum 10 points for this criterion out of the 100 total points and a "NO" answer is awarded 0 points.

YES

37 **Yes - No**

If awarded on this TIPS Contract, for the duration of the Contract, Vendor agrees to provide, upon request, their then current catalog pricing, as defined in the solicitation and below, to TIPS upon request for any goods and services offered on Vendor's TIPS Contract.

"Catalog" means the available list of tangible personal property or services, in the most current listing, regardless of date, during the life of the contract, that takes the form of a catalog, price list, schedule, shelf price or other form that:

A. is regularly maintained by the manufacturer or Vendor of an item; and
B. is either published or otherwise available for inspection by a customer during the purchase process;
C. to which the minimum discount proposed by the proposing Vendor may be applied.

YES

38 **TIPS Administration Fee**

By submitting a proposal, I agree that all pricing submitted to TIPS shall include the Administration Fee, as designated in the solicitation or as otherwise agreed in writing which shall be remitted to TIPS by the Vendor, or the vendor's named resellers, and as agreed to in the Vendor Agreement. I agree that the fee shall not and will not be added by the Vendor as a separate line item on a TIPS member invoice, quote, proposal or any other written communications with the TIPS member.

39	**Yes - No** Vendor agrees to remit to TIPS the required administration fee or, if resellers are named, Vendor agrees to guarantee the fee remittance by or for the reseller named by the vendor? TIPS/ESC Region 8 is required by Texas Government Code § 791 to be compensated for its work and thus, failure to agree shall render your response void and it will not be considered. Agreed
40	**TIPS Administration Fee Paid by Vendor - Not Charged to Customer** Vendor understands and agrees that it owes TIPS a TIPS Administration Fee (published in the RFP/RCSP document) on every TIPS sale made under an awarded TIPS Contract. Vendor further understands and agrees that Vendor shall submit pricing with this proposal which includes and accounts for the TIPS Administration Fee and ***shall never*** separately charge the TIPS Member Customer the TIPS fee or add the TIPS Administration Fee line item to an invoice or similar purchase document. Submission of this proposal is Vendor's certification that Vendor agrees to this mandatory term.
41	**Additional Discounts?** Do you offer additional discounts to TIPS members for large order quantities or large scope of work? No
42	**Years in Business as Proposing Company** Years in business as proposing company? 2
43	**Resellers:** Does the vendor have resellers that it will name under this contract? Resellers are defined as other companies that sell your products under an agreement with you, the awarded vendor of TIPS. EXAMPLE: BIGmart is a reseller of ACME brand televisions. If ACME were a TIPS awarded vendor, then ACME would list BIGmart as a reseller. (If applicable, Vendor should add all Authorized Resellers within the TIPS Vendor Portal upon award). No
44	**Right of Refusal** The proposing vendor has the right not to sell under the awarded agreement with a TIPS member at vendor's discretion unless required by law.

45 **NON-COLLUSIVE BIDDING CERTIFICATE**

By submission of this bid or proposal, the Bidder certifies that:

1) This bid or proposal has been independently arrived at without collusion with any other Bidder or with any Competitor;

2) This bid or proposal has not been knowingly disclosed and will not be knowingly disclosed, prior to the opening of bids, or proposals for this project, to any other Bidder, Competitor or potential competitor:

3) No attempt has been or will be made to induce any other person, partnership or corporation to submit or not to submit a bid or proposal;

4) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties being applicable to the Bidder as well as to the person signing in its behalf.

Not a negotiable term. Failure to agree will render your proposal non-responsive and it will not be considered.

46 **CONFLICT OF INTEREST QUESTIONNAIRE - FORM CIQ - Do you have any CONFLICT OF INTEREST TO REPORT OR DISCLOSE under this statutory requirement?**

Do you have any CONFLICT OF INTEREST TO REPORT OR DISCLOSE under this statutory requirement? YES or NO

If you have a conflict of interest as described in this form or the Local Government Code Chapter 176, cited therein- you are required to complete and file with TIPS.
The Form CIQ is one of the attachments to this solicitation.

There is an optional upload for this form provided if you have a conflict and must file the form

No

47 **Filing of Form CIQ**

If yes (above), have you filed a form CIQ by uploading the form to this RFP as directed above?

No response

48 **Regulatory Standing**

I certify to TIPS for the proposal attached that my company is in good standing with all governmental agencies Federal or state that regulate any part of our business operations. If not, please explain in the next attribute question.

Yes

49 **Regulatory Standing**

Regulatory Standing explanation of no answer on previous question.

No response

50	**Antitrust Certification Statements (Tex. Government Code § 2155.005)** By submission of this bid or proposal, the Bidder certifies that: I affirm under penalty of perjury of the laws of the State of Texas that: (1) I am duly authorized to execute this contract on my own behalf or on behalf of the company, corporation, firm, partnership or individual (Company) listed below; (2) In connection with this bid, neither I nor any representative of the Company has violated any provision of the Texas Free Enterprise and Antitrust Act, Tex. Bus. & Comm. Code Chapter 15; (3) In connection with this bid, neither I nor any representative of the Company has violated any federal antitrust law; (4) Neither I nor any representative of the Company has directly or indirectly communicated any of the contents of this bid to a competitor of the Company or any other company, corporation, firm, partnership or individual engaged in the same line of business as the Company.

51 **Suspension or Debarment Instructions**

Instructions for Certification:

1. By answering yes to the next Attribute question below, the vendor and prospective lower tier participant is providing the certification set out herein in accordance with these instructions.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification in addition to other remedies available to the federal government, the department or agency with which this transaction originated may pursue available remedies, including suspension and / or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms “covered transaction,” “debarred,” “suspended,” “ineligible,” “lower tier covered transaction,” “participants,” “person,” “primary covered transaction,” “principal,” “proposal” and “voluntarily excluded,” as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled “Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction” without modification in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible or voluntarily excluded from participation in this transaction, in addition to other remedies available to the federal government, the department or agency with which this transaction originated may pursue available remedies, including suspension and / or debarment.

52 **Suspension or Debarment Certification**

By answering yes, you certify that no federal suspension or debarment is in place, which would preclude receiving a federally funded contract as described above.

Yes

53

Non-Discrimination Statement and Certification

In accordance with Federal civil rights law, all U.S. Departments, including the U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3)
email: program.intake@usda.gov.

(Title VI of the Education Amendments of 1972; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975; Title 7 CFR Parts 15, 15a, and 15b; the Americans with Disabilities Act; and FNS Instruction 113-1, Civil Rights Compliance and Enforcement – Nutrition Programs and Activities)

All U.S. Departments, including the USDA are equal opportunity provider, employer, and lender.

Not a negotiable term. Failure to agree by answering YES will render your proposal non-responsive and it will not be considered. I certify that in the performance of a contract with TIPS or its members, that our company will conform to the foregoing anti-discrimination statement and comply with the cited and all other applicable laws and regulations.

☑ Yes, I certify (Yes)

54

2 CFR PART 200 Contract Provisions Explanation

Required Federal contract provisions of Federal Regulations for Contracts for contracts with ESC Region 8 and TIPS Members:

The following provisions are required to be in place and agreed if the procurement is funded in any part with federal funds.

The ESC Region 8 and TIPS Members are the subgrantee or Subrecipient by definition. Most of the provisions are located in 2 CFR PART 200 - Appendix II to Part 200—Contract Provisions for Non-Federal Entity Contracts Under Federal Awards at 2 CFR PART 200. Others are included within 2 CFR part 200 et al.

In addition to other provisions required by the Federal agency or non-Federal entity, all contracts made by the non-Federal entity under the Federal award must contain provisions covering the following, as applicable.

55

2 CFR PART 200 Contracts

Contracts for more than the simplified acquisition threshold currently set at $250,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

Notice: Pursuant to the above, when federal funds are expended by ESC Region 8 and TIPS Members, ESC Region 8 and TIPS Members reserves all rights and privileges under the applicable laws and regulations with respect to this procurement in the event of breach of contract by either party.

Does vendor agree?

Yes

56

2 CFR PART 200 Termination

Termination for cause and for convenience by the grantee or subgrantee including the manner by which it will be effected and the basis for settlement. (All contracts in excess of $10,000)

Pursuant to the above, when federal funds are expended by ESC Region 8 and TIPS Members, ESC Region 8 and TIPS Members reserves the right to terminate any agreement in excess
of $10,000 resulting from this procurement process for cause after giving the vendor an appropriate opportunity and up to 30 days, to cure the causal breach of terms and conditions. ESC Region 8 and
TIPS Members reserves the right to terminate any agreement in excess of $10,000 resulting from this procurement process for convenience with 30 days notice in writing to the awarded vendor. The vendor
would be compensated for work performed and goods procured as of the termination date if for convenience of the ESC Region 8 and TIPS Members. Any award under this procurement process is not exclusive and the ESC Region 8 and TIPS reserves the right to purchase goods and services from other vendors when it is in the best interest of the ESC Region 8 and TIPS.

Does vendor agree?

Yes

57

2 CFR PART 200 Clean Air Act

Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—Contracts and subgrants of amounts in excess of $150,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

Pursuant to the Clean Air Act, et al above, when federal funds are expended by ESC Region 8 and TIPS Members, ESC Region 8 and TIPS Members requires that the proposer certify that during the term of
an award by the ESC Region 8 and TIPS Members resulting from this procurement process the vendor agrees to comply with all of the above regulations, including all of the terms listed and referenced therein.

Does vendor agree?

Yes

58

2 CFR PART 200 Byrd Anti-Lobbying Amendment

Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

Pursuant to the above, when federal funds are expended by ESC Region 8 and TIPS Members, ESC Region 8 and TIPS Members requires the proposer certify that during the term and during the life of any contract with ESC Region 8 and TIPS Members resulting from this procurement process the vendor certifies to the terms included or referenced herein.

Does vendor agree?

Yes

59

2 CFR PART 200 Federal Rule

Compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15). (Contracts, subcontracts, and subgrants of amounts in excess of $250,000)

Pursuant to the above, when federal funds are expended by ESC Region 8 and TIPS Members, ESC Region 8 and TIPS Members requires the proposer certify that in performance of the contracts, subcontracts, and subgrants of amounts in excess of $250,000, the vendor will be in compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15).

Does vendor certify that it is in compliance with the Clean Air Act?

Yes

60

2 CFR PART 200 Procurement of Recovered Materials

A non-Federal entity that is a state agency or agency of a political subdivision of a state and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with
maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

Does vendor certify that it is in compliance with the Solid Waste Disposal Act as described above?

Yes

61

2 CFR PART 200 Rights to Inventions

If the Federal award meets the definition of “funding agreement” under 37 CFR §401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that “funding agreement,” the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.

Pursuant to the above, when the foregoing applies to ESC Region 8 and TIPS Members, Vendor certifies that during the term of an award resulting from this procurement process, Vendor agrees to comply with all applicable requirements as referenced in the Federal rule above.

Does vendor agree?

Yes

62

2 CFR PART 200 Domestic Preferences for Procurements

As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of 2 CFR Part 200.322, “Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stag through the application of coatings, occurred in the United States. Moreover, for purposes of 2 CFR Part 200.322, “Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum, plastics and polymer-based products such as polyvinyl chloride pipe, aggregates such as concrete, glass, including optical fiber, and lumber.

Pursuant to the above, when federal funds are expended by ESC Region 8 and TIPS Members, Vendor certifies that to the greatest extent practicable Vendor will provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

Does vendor agree?

Yes

63

2 CFR PART 200 Ban on Foreign Telecommunications

Federal grant funds may not be used to purchase equipment, services, or systems that use “covered telecommunications” equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. “Covered telecommunications” means purchases from Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities), and video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

Pursuant to the above, when federal funds are expended by ESC Region 8 and TIPS Members, Vendor certifies that Vendor will not purchase equipment, services, or systems that use “covered telecommunications”, as defined by 2 CFR §200.216 equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

Does vendor agree?

Yes

64

2 CFR PART 200 Contract Cost & Price

For contracts more than the simplified acquisition threshold currently set at $250,000, a TIPS Member may, in very rare circumstances, be required to negotiate profit as a separate element of the price pursuant to 2 C.F.R. 200.324(b). Under those circumstances, Vendor agrees to provide information and negotiate with the TIPS Member regarding profit as a separate element of the price. However, Vendor certifies that the total price charged by the Vendor shall not exceed the Vendor's TIPS pricing and pricing terms proposed.

Does Vendor Agree?

Yes

65

FEMA Fund Certifications

Submission of this proposal is Vendor's certification that Vendor agrees to this term. Vendor certifies that **IF and when** Vendor accepts a TIPS purchase paid for in full or part with FEMA funds, Vendor certifies that:

(1) Vendor agrees to provide the TIPS Member, the FEMA Administrator, the Comptroller General of the United States, or any of their authorized representatives access to and rights to reproduce any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions. The Vendor agrees to provide the FEMA Administrator or an authorized representatives access to construction or other work sites pertaining to the work being completed under the contract. Vendor acknowledges and agrees that no language in this contract or the contract with the TIPS Member is intended to prohibit audits or internal reviews by the FEMA Administrator or the Comptroller General of the United States.

(2) The Vendor shall not use the Department of Homeland Security's seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific FEMA pre-approval.

(3) The Vendor will comply with all applicable Federal law, regulations, executive orders, FEMA policies, procedures, and directives.

(4) The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract.

(5) The Vendor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the Vendor's actions pertaining to this contract.

66

Certification of Compliance with the Energy Policy and Conservation Act

When appropriate and to the extent consistent with the law, Vendor certifies that it will comply with the Energy Policy and Conservation Act (42 U.S.C. 6321 et seq; 49 C.F.R. Part 18) and any mandatory standards and policies relating to energy efficiency which are contained in applicable state energy conservation plans issued in compliance with the Act.

Does Vendor agree?

Yes

67	**Certification Regarding Lobbying** Applicable to Grants, Subgrants, Cooperative Agreements, and Contracts Exceeding $100,000 in Federal Funds Submission of this certification is a prerequisite for making or entering into this transaction and is imposed by section 1352, Title 31, U.S. Code. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure. The undersigned certifies, to the best of his or her knowledge and belief, that: (1) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with the awarding of a Federal contract, the making of a Federal grant, the making of a Federal loan, the entering into a cooperative agreement, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative agreement. (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “disclosure Form to Report Lobbying,” in accordance with its instructions. (3) The undersigned shall require that the language of this certification be included in the award documents for all covered subawards exceeding $100,000 in Federal funds at all appropriate tiers and that all subrecipients shall certify and disclose accordingly. I HAVE NOT Lobbied per above
68	**If you answered "I HAVE lobbied" to the above Attribute Question** If you answered "I HAVE lobbied" to the above Attribute question, you must download the Lobbying Report "Standard From LLL, disclosure Form to Report Lobbying" which includes instruction on completing the form, complete and submit it in the Response Attachments section as a report of the lobbying activities you performed or paid others to perform.
69	**Subcontracting with Small and Minority Businesses, Women's Business Enterprises, and Labor Surplus Area Firms.** Do you ever anticipate the possibility of subcontracting any of your work under this award if you are successful? IF NO, DO NOT ANSWER THE NEXT ATTRIBUTE QUESTION. . IF YES, and ONLY IF YES, you must answer the next question YES if you want a TIPS Member to be authorized to spend Federal Grant Funds for Procurement. YES

70	**ONLY IF YES TO THE PREVIOUS QUESTION OR if you ever do subcontract any part of your performance under the TIPS Agreement, do you agree to comply with the following federal requirements?** ONLY IF YES TO THE PREVIOUS QUESTION OR if you ever do subcontract any part of your performance under the TIPS Agreement, do you agree to comply with the following federal requirements? Federal Regulation 2 CFR §200.321 Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms. (a)The non-Federal entity must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. (b) Affirmative steps must include: (1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists; (2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources; (3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises; (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; (5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce ; and (6) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs(1) through (5) of this section. YES
71	**Indemnification** The ESC Region 8 and TIPS is a Texas Political Subdivision and a local governmental entity; therefore, is prohibited from indemnifying third parties pursuant to the Texas Constitution (Article 3, Section 52) except as specifically provided by law or as ordered by a court of competent jurisdiction. A provision in a contract to indemnify or hold a party harmless is a promise to pay for any expenses the indemnified party incurs, if a specified event occurs, such as breaching the terms of the contract or negligently performing duties under the contract. Article III, Section 49 of the Texas Constitution states that "no debt shall be created by or on behalf of the State ... " The Attorney General has counseled that a contractually imposed obligation of indemnity creates a "debt" in the constitutional sense. Tex. Att'y Gen. Op. No. MW-475 (1982). Contract clauses which require the System or institutions to indemnify must be deleted or qualified with "to the extent permitted by the Constitution and Laws of the State of Texas." Liquidated damages, attorney's fees, waiver of vendor's liability, and waiver of statutes of limitations clauses should also be deleted or qualified with "to the extent permitted by the Constitution and laws of State of Texas." Not a negotiable term. Failure to agree will render your proposal non-responsive and it will not be considered. Do you agree to these terms? ☑ Yes, I Agree (Yes)

72 **Remedies**

The parties shall be entitled to exercise any right or remedy available to it either at law or in equity, subject to the choice of law, venue
and service of process clauses limitations agreed herein. Nothing in this agreement shall commit the TIPS to an arbitration resolution
of any disagreement under any circumstances. Any Claim arising out of or related to the Contract, except for those specifically waived
under the terms of the Contract, may, after denial of the Board of Directors, be subject to mediation at the request of either party. Any
issues not resolved hereunder MAY be referred to non-binding mediation to be conducted by a mutually agreed upon mediator as a
prerequisite to the filing of any lawsuit over such issue(s). The parties shall share the mediator's fee and any associated filing fee
equally. Mediation shall be held in Camp or Titus County, Texas. Agreements reached in mediation shall be reduced to writing, and
will be subject to the approval by the District's Board of Directors, signed by the Parties if approved by the Board of Directors, and, if
signed, shall thereafter be enforceable as provided by the laws of the State of Texas.

Do you agree to these terms?

Yes, I Agree

73 **Remedies Explanation of No Answer**

No response

74 **Choice of Law**

The agreement between the Vendor and TIPS/ESC Region 8 and any addenda or other additions resulting from this procurement process, however described, shall be governed by, construed and enforced in accordance with the laws of the State of Texas, regardless of any conflict of laws principles.
THIS DOES NOT APPLY to a vendor's agreement entered into with a TIPS Member, as the Member may be located outside Texas.

Do you agree to these terms?

Agreed

75 **Venue, Jurisdiction and Service of Process**

Any proceeding, involving Region 8 ESC or TIPS, arising out of or relating to this procurement process or any contract issued by TIPS resulting from or any contemplated transaction shall be brought in a court of competent jurisdiction in Camp County, Texas and each of the parties irrevocably submits to the exclusive jurisdiction of said court in any such proceeding, waives any objection it may now or hereafter have to venue or to convenience of forum, agrees that all claims in respect of the Proceeding shall be heard and determined only in any such court, and agrees not to bring any proceeding arising out of or relating to this procurement process or any contract resulting from or any contemplated transaction in any other court. The parties agree that either or both of them may file a copy of this paragraph with any court as written evidence of the knowing, voluntary and freely bargained for agreement between the parties irrevocably to waive any objections to venue or to convenience of forum. Process in any Proceeding referred to in the first sentence of this Section may be served on any party anywhere in the world. Any dispute resolution process other than litigation shall have venue in Camp County or Titus County Texas.

Do you agree to these terms?

Agreed

76 Infringement(s)

The successful vendor will be expected to indemnify and hold harmless the TIPS and its employees, officers, agents, representatives, contractors, assignees and designees from any and all third party claims and judgments involving infringement of patent, copyright, trade secrets, trade or service marks, and any other intellectual or intangible property rights attributed to or claims based on the Vendor's proposal or Vendor's performance of contracts awarded and approved.

Do you agree to these terms?

Yes, I Agree

77 Infringement(s) Explanation of No Answer

No response

78 Contract Governance

Any contract made or entered into by the TIPS is subject to and is to be governed by Section 271.151 et seq, Tex Loc Gov't Code. Otherwise, TIPS does not waive its governmental immunities from suit or liability except to the extent expressly waived by other applicable laws in clear and unambiguous language.

☑ Yes, I Agree (Yes)

79 Payment Terms and Funding Out Clause

Payment Terms:

TIPS or TIPS Members shall not be liable for interest or late payment fees on past-due balances at a rate higher than permitted by the laws or regulations of the jurisdiction of the TIPS Member.

Funding Out Clause:

Vendor agrees to abide by the laws and regulations, including Texas Local Government Code § 271.903, or any statutory or regulatory limitations of the jurisdiction of any TIPS Member which governs contracts entered into by the Vendor and TIPS or a TIPS Member that requires all contracts approved by TIPS or a TIPS Member are subject to the budgeting and appropriation of currently available funds by the entity or its governing body.

See statute(s) for specifics or consult your legal counsel.

Not a negotiable term. Failure to agree will render your proposal non-responsive and it will not be considered.

Do you agree to these terms?

☑ Yes, I Agree (Yes)

80

Insurance and Fingerprint Requirements Information

Insurance

If applicable and your staff will be on TIPS member premises for delivery, training or installation etc. and/or with an automobile, you must carry automobile insurance as required by law. You may be asked to provide proof of insurance.

Fingerprint

It is possible that a vendor may be subject to Chapter 22 of the Texas Education Code. The Texas Education Code, Chapter 22, Section 22.0834 & 22.08341. Statutory language may be found at: http://www.statutes.legis.state.tx.us/

If the vendor has staff that meet both of these criterion:

(1) will have continuing duties related to the contracted services; and

(2) has or will have direct contact with students

Then you have ”covered” employees for purposes of completing the attached form.

TIPS recommends all vendors consult their legal counsel for guidance in compliance with this law. If you have questions on how to comply, see below. If you have questions on compliance with this code section, contact the Texas Department of Public Safety Non-Criminal Justice Unit, Access and Dissemination Bureau, FAST-FACT at NCJU@txdps.state.tx.us and you should send an email identifying you as a contractor to a Texas Independent School District or ESC Region 8 and TIPS. Texas DPS phone number is (512) 424-2474.

See form in the next attribute to complete entitled:
Texas Education Code Chapter 22 Contractor Certification for Contractor Employees

81

Texas Education Code Chapter 22 Contractor Certification for Contractor Employees

Introduction: Texas Education Code Chapter 22 requires entities that contract with school districts to provide services to obtain criminal history record information regarding covered employees. Contractors must certify to the district that they have complied. Covered employees with disqualifying criminal histories are prohibited from serving at a school district.

Definitions: Covered employees: Employees of a contractor or subcontractor who have or will have continuing duties related to the service to be performed at the District and have or will have direct contact with students. The District will be the final arbiter of what constitutes direct contact with students. Disqualifying criminal history: Any conviction or other criminal history information designated by the District, or one of the following offenses, if at the time of the offense, the victim was under 18 or enrolled in a public school:

(a) a felony offense under Title 5, Texas Penal Code; (b) an offense for which a defendant is required to register as a sex offender under Chapter 62, Texas Code of Criminal Procedure; or (c) an equivalent offense under federal law or the laws of another state.

I certify that:

NONE (Section A) of the employees of Contractor and any subcontractors are covered employees, as defined above. If this box is checked, I further certify that Contractor has taken precautions or imposed conditions to ensure that the employees of Contractor and any subcontractor will not become covered employees. Contractor will maintain these precautions or conditions throughout the time the contracted services are provided.

OR

SOME (Section B) or all of the employees of Contractor and any subcontractor are covered employees. If this box is checked, I further certify that:

(1) Contractor has obtained all required criminal history record information regarding its covered employees. None of the covered employees has a disqualifying criminal history.

(2) If Contractor receives information that a covered employee subsequently has a reported criminal history, Contractor will immediately remove the covered employee from contract duties and notify the District in writing within 3 business days.

(3) Upon request, Contractor will provide the District with the name and any other requested information of covered employees so that the District may obtain criminal history record information on the covered employees.

(4) If the District objects to the assignment of a covered employee on the basis of the covered employee's criminal history record information, Contractor agrees to discontinue using that covered employee to provide services at the District.

Noncompliance or misrepresentation regarding this certification may be grounds for contract termination.

None

82

Texas Business and Commerce Code § 272 Requirements as of 9-1-2017

SB 807 prohibits construction contracts to have provisions requiring the contract to be subject to the laws of another state, to be required to litigate the contract in another state, or to require arbitration in another state. A contract with such provisions is voidable. Under this new statute, a “construction contract” includes contracts, subcontracts, or agreements with (among others) architects, engineers, contractors, construction managers, equipment lessors, or materials suppliers. “Construction contracts” are for the design, construction, alteration, renovation, remodeling, or repair of any building or improvement to real property, or for furnishing materials or equipment for the project. The term also includes moving, demolition, or excavation. BY RESPONDING TO THIS SOLICITATION, AND WHEN APPLICABLE, THE PROPOSER AGREES TO COMPLY WITH THE TEXAS BUSINESS AND COMMERCE CODE § 272 WHEN EXECUTING CONTRACTS WITH TIPS MEMBERS THAT ARE TEXAS GOVERNMENT ENTITIES.

83

Texas Government Code 2270 & 2271 Verification Form

Texas Government Code 2270 & 2271 Verification Form

If (a) Vendor is not a sole proprietorship; (b) Vendor has ten (10) or more full-time employees; and (c) this Agreement has a value of $100,000 or more, the following certification shall apply; otherwise, this certification is not required. Pursuant to Chapter 2271 of the Texas Government Code, the Vendor hereby certifies and verifies that neither the Vendor, nor any affiliate, subsidiary, or parent company of the Vendor, if any (the "Vendor Companies"), boycotts Israel, and the Vendor agrees that the Vendor and Vendor Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

Our entity further certifies that it is is not listed on and we do not do business with companies prohibited by Texas Government Code 2270 or that are on the Texas Comptroller of Public Accounts list of Designated Foreign Terrorists Organizations per Texas Gov't Code 2270.0153 found at https://comptroller.texas.gov/purchasing/docs/foreign-terrorist.pdf

I swear and affirm that the above is true and correct.

YES

84

Logos and other company marks

Please upload your company logo to be added to your individual profile page on the TIPS website. If any particular specifications are required for use of your company logo, please upload that information under the "Logo and Other Company Marks" section under the “Response Attachment” tab. Preferred Logo Format: 300 x 225 px - .png, .eps, .jpeg preferred

Potential uses of company logo:

* Your Vendor Profile Page of TIPS website

* Potentially on TIPS website scroll bar for Top Performing Vendors

* TIPS Quarterly eNewsletter sent to TIPS Members

* Co-branding Flyers and or email blasts to our TIPS Members (Permission and approval will be obtained before publishing)

85 **Solicitation Deviation/Compliance**

Does the vendor agree with the General Conditions Standard Terms and Conditions or Item Specifications listed in this proposal invitation?

Yes

86 **Solicitation Exceptions/Deviations Explanation**

If the bidder intends to deviate from the General Conditions Standard Terms and Conditions or Item Specifications listed in this proposal invitation, all such deviations must be listed on this attribute, with complete and detailed conditions and information included or attached.
TIPS will consider any deviations in its proposal award decisions, and TIPS reserves the right to accept or reject any bid based upon any deviations indicated below or in any attachments or inclusions.
In the absence of any deviation entry on this attribute, the proposer assures TIPS of their full compliance with the Standard Terms and Conditions, Item Specifications, and all other information contained in this Solicitation.

No response

87 **Agreement Deviation/Compliance**

Does the vendor agree with the language in the Vendor Agreement?

Yes

88 **Agreement Exceptions/Deviations Explanation**

If the proposing Vendor desires to deviate form the Vendor Agreement language, all such deviations must be listed on this attribute, with complete and detailed conditions and information included. TIPS will consider any deviations in its proposal award decisions, and TIPS reserves the right to accept or reject any proposal based upon any deviations indicated below. In the absence of any deviation entry on this attribute, the proposer assures TIPS of their full compliance with the Vendor Agreement.

No response

89 **Felony Conviction Notice**

Texas Education Code, Section 44.034, Notification of Criminal History, Subsection (a), states “a person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony.” Subsection (b) states “a school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract.” (c) This section does not apply to a publicly held corporation. The person completing this proposal certifies that they are authorized to provide the answer to this question.

Select A., B. or C.

A. My firm is a publicly held corporation; therefore, this reporting requirement is not applicable.

OR B.My firm is not owned nor operated by anyone who has been convicted of a felony, OR

C. My firm is owned or operated by the following individual(s) who has/have been convicted of a felony. (if you answer C below, you are required to provide information in the next attribute.

B. Firm not owned nor operated by felon; per above

90 **If you answered C. My Firm is owned or operated by a felon to the previous question, you are REQUIRED TO ANSWER THE FOLLOWING QUESTIONS.**

If you answered C. My Firm is owned or operated by a felon to the previous question, you must provide the following information.

1. Name of Felon(s)

2. The named person's role in the firm, and

3. Details of Conviction(s).

No response

91 **Required Confidentiality Claim Form**

Required Confidentiality Claim Form
This completed form is required by TIPS. By submitting a response to this solicitation you agree to download from the "Attachments" section, complete according to the instructions on the form, then upload the completed form, with any confidential attachments, if applicable, to the "Response Attachments" section titled "Confidentiality Form" in order to provide to TIPS the completed form titled, "CONFIDENTIALITY CLAIM FORM". THIS REQUIRED PROCESS IS THE ONLY WAY TO DEEM PROPOSAL DOCUMENTATION CONFIDENTIAL ANY OTHER CONFIDENTIAL DESIGNATION WILL BE DISREGARDED UNLESS THE DOCUMENT IS IDENTIFIED BY AND ATTACHED TO THE REQUIRED FORM. By completing this process, you provide us with the information we require to comply with the open record laws of the State of Texas as they may apply to your proposal submission. If you do not provide the form with your proposal, an award will not be made if your proposal is qualified for an award, until TIPS has an accurate, completed form from you.
Read the form carefully before completing and if you have any questions, email bids@tips-usa.com.

92 **Member Access to Vendor Proposal**

Notwithstanding any other information provided in this solicitation or Vendor designation of certain documentation as confidential or proprietary, Vendor's acceptance of this TIPS Contract constitutes Vendor's consent to the disclosure of Vendor's comprehensive proposal, including any information deemed confidential or proprietary, **to TIPS Members**. The proposing Vendor agrees that TIPS shall not be responsible or liable for any use or distribution of information or documentation by TIPS Members or any other party. By submitting this proposal, Vendor certifies the foregoing.

93 **Choice of Law clauses with TIPS Members**

If the vendor is awarded a contract with TIPS under this solicitation, the vendor agrees to make any Choice of Law clauses in any contract or agreement entered into between the awarded vendor and with a TIPS member entity to read as follows: "Choice of law shall be the laws of the state where the customer resides" or words to that effect.

Agreed

94 **Venue of dispute resolution with a TIPS Member**

In the event of litigation or use of any dispute resolution model when resolving disputes with a TIPS member entity as a result of a transaction between the vendor and TIPS or the TIPS member entity, the Venue for any litigation or other agreed upon model shall be in the state and county where the customer resides unless otherwise agreed by the parties at the time the dispute resolution model is decided by the parties.

Agreed

95 **Automatic renewal of contracts or agreements with TIPS or a TIPS member entity**

This clause **DOES NOT** prohibit multiyear contracts or agreements with TIPS member entities.
Because TIPS and TIPS members are governmental entities subject to laws that control appropriations of funds during their fiscal years for contracts and agreements to provide goods and services, does the Vendor agree to limit any automatic renewal clauses of a contract or agreement executed as a result of this TIPS solicitation award to not longer than "month to month" and at the TIPS contracted rate.

Agreed

96	**Indemnity Limitation with TIPS Members** Texas and other states restrict by law or state Constitution the ability of a governmental entity to indemnify others. TIPS requires that any contract entered into between a vendor and TIPS or a TIPS Member as a result of an award under this Solicitation limit the requirement that the Customer indemnify the Vendor by either eliminating any such indemnity requirement clauses in any agreements, contracts or other binding documents **OR** by prefacing all indemnity clauses required of TIPS or the TIPS Member entity with the following: "To the extent permitted by the laws or the Constitution of the state where the customer resides, ". **Agreement is a required condition to award of a contract resulting from this Solicitation.** Agreed
97	**Arbitration Clauses** Except for certain circumstances, TIPS forbids a mandatory arbitration clause in any contract or agreement entered into between the awarded vendor with TIPS or a TIPS member entity. Does the vendor agree to exclude any arbitration requirement in any contracts or agreement entered into between TIPS or a TIPS member entity through an awarded contract with TIPS? Agreed
98	**Required Vendor Sales Reporting** By responding to this Solicitation, you agree to report to TIPS all sales made under any awarded Agreement with TIPS. Vendor is required to report all sales under the TIPS contract to TIPS. If the TIPS Member entity requesting a price from the awarded Vendor requests the TIPS contract, Vendor must include the TIPS Contract number on any communications with the TIPS Member entity. If awarded, you will be provided access to the Vendor Portal. To report sales, login to the TIPS Vendor Portal and click on the PO's and Payments tab. Pages 3-7 of the Vendor Portal User Guide will walk you through the process of reporting sales to TIPS. Please refer to the TIPS Accounting FAQ's for more information about reporting sales and if you have further questions, contact the Accounting Team at accounting@tips-usa.com. The Vendor or vendor assigned dealers are responsible for keeping record of all sales that go through the TIPS Agreement and submitting same to TIPS.
99	**Upload of Current W-9 Required** Please note that you are required by TIPS to upload a current W-9 Internal Revenue Service (IRS) Tax Form for your entity. This form will be utilized by TIPS to properly identify your entity.
100	**CERTIFICATION REGARDING BOYCOTTING CERTAIN ENERGY COMPANIES (Texas law as of September 1, 2021)** **By submitting a proposal to this Solicitation, you certify that you agree, when it is applicable, to the following required by Texas law as of September 1, 2021:** If (a) company is not a sole proprietorship; (b) company has ten (10) or more full-time employees; and (c) this contract has a value of $100,000 or more that is to be paid wholly or partly from public funds, the following certification shall apply; otherwise, this certification is not required. Pursuant to Tex. Gov't Code Ch. 2274 of SB 13 (87th session), the company hereby certifies and verifies that the company, or any wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of these entities or business associations, if any, does not boycott energy companies and will not boycott energy companies during the term of the contract. For purposes of this contract, the term "company" shall mean an organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, that exists to make a profit. The term "boycott energy company" shall mean "without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company (a) engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law, or (b) does business with a company described by paragraph (a)." *See* Tex. Gov't Code § 809.001(1).

101	**CERTIFICATION PROHIBITING DISCRIMINATION AGAINST FIREARM AND AMMUNITION INDUSTRIES (Texas law as of September 1, 2021)** **By submitting a proposal to this Solicitation, you certify that you agree, when it is applicable, to the following required by Texas law as of September 1, 2021:** If (a) company is not a sole proprietorship; (b) company has at least ten (10) full-time employees; (c) this contract has a value of at least $100,000 that is paid wholly or partly from public funds; (d) the contract is not excepted under Tex. Gov't Code § 2274.003 of SB 19 (87th leg.); and (e) governmental entity has determined that company is not a sole-source provider or governmental entity has not received any bids from a company that is able to provide this written verification, the following certification shall apply; otherwise, this certification is not required. Pursuant to Tex. Gov't Code Ch. 2274 of SB 19 (87th session), the company hereby certifies and verifies that the company, or association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary parent company, or affiliate of these entities or associations, that exists to make a profit, does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and will not discriminate during the term of this contract against a firearm entity or firearm trade association. For purposes of this contract, "discriminate against a firearm entity or firearm trade association" shall mean, with respect to the entity or association, to: "(1) refuse to engage in the trade of any goods or services with the entity or association based solely on its status as a firearm entity or firearm trade association; (2) refrain from continuing an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association; or (3) terminate an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association. *See* Tex. Gov't Code § 2274.001(3) of SB 19. "Discrimination against a firearm entity or firearm trade association" does not include: "(1) the established policies of a merchant, retail seller, or platform that restrict or prohibit the listing or selling of ammunition, firearms, or firearm accessories; and (2) a company's refusal to engage in the trade of any goods or services, decision to refrain from continuing an existing business relationship, or decision to terminate an existing business relationship to comply with federal, state, or local law, policy, or regulations or a directive by a regulatory agency, or for any traditional business reason that is specific to the customer or potential customer and not based solely on an entity's or association's status as a firearm entity or firearm trade association." *See* Tex. Gov't Code § 2274.001(3) of SB 19.
102	**CERTIFICATION REGARDING CERTAIN FOREIGN-OWNED COMPANIES IN CONNECTION WITH CRITICAL INFRASTRUCTURE (Texas law as of September 1, 2021)** **By submitting a proposal to this Solicitation, you certify that you agree to the following required by Texas law as of September 1, 2021:** Proposing Company is prohibited from entering into a contract or other agreement relating to critical infrastructure that would grant to the company direct or remote access to or control of critical infrastructure in this state, excluding access specifically allowed by the Proposing Company for product warranty and support purposes. Company, certifies that neither it nor its parent company nor any affiliate of company or its parent company, is (1) owned by or the majority of stock or other ownership interest of the company is held or controlled by individuals who are citizens of China, Iran, North Korea, Russia, or a designated country; (2) a company or other entity, including governmental entity, that is owned or controlled by citizens of or is directly controlled by the government of China, Iran, North Korea, Russia, or a designated country; or (3) headquartered in China, Iran, North Korea, Russia, or a designated country. For purposes of this contract, "critical infrastructure" means "a communication infrastructure system, cybersecurity system, electric grid, hazardous waste treatment system, or water treatment facility." *See* Tex. Gov't Code § 2274.0101(2) of SB 1226 (87th leg.). The company verifies and certifies that company will not grant direct or remote access to or control of critical infrastructure, except for product warranty and support purposes, to prohibited individuals, companies, or entities, including governmental entities, owned, controlled, or headquartered in China, Iran, North Korea, Russia, or a designated country, as determined by the Governor.
103	**Acknowledgement** By submitting this proposal, Vendor certifies that it has read, examined, and understands all portions of this solicitation including but not limited to all attribute questions, attachments, solicitation documents, bid notes, and the Vendor Agreement(s). Vendor certifies that, if found to be necessary by the proposing vendor, vendor has sought the advice of counsel in understanding all portions of the solicitation.

TIPS RFP 220101 Safety Equipment, Supplies and Services

ALL INFORMATION MUST BE TYPED AND FORM MUST BE UPLOADED IN EXCEL FORMAT. DO NOT HANDWRITE REFERENCES AND DO NOT CONVERT EXCEL SHEET TO ANY OTHER FORMAT.

REFERENCES

Please provide three (3) references from three different entities, preferably from school districts or other governmental entities who have used your the last three years. Additional references may be required. DO NOT INCLUDE TIPS EMPLOYEES AS A REFERENCE.

Verify your references emails are deliverable and that they agree to provide a reference. Failure to do this may delay the evaluation process.

You may provide more than three (3) references.

Entity Name	Contact Person	VALID EMAIL IS REQUIRED	Phone
Texas Southern University	Karen Stewart	Karen.stewart@tsu.edu	(713) 313-7509
Houston Independent school district	Dahirou N'Diaye	dndiaye@houstonisd.org	(281) 840-8058
The Spires Condominium	Adner D Cisneros	Office@thespires.org	(713) 898-7958

TIPS RFP # 220101

Required Confidential Information Status Form

Motive Wireless DBA Motive Lighting

Name of company

Marquis Wallace (Business Development)

Printed Name and Title of Authorized Company Officer declaring below the confidential status of material

5781 Westheimer Rd Floor 10	Houston	TX	77057	884.766.8483
Address	**City**	**State**	**ZIP**	**Phone**

ALL VENDORS MUST COMPLETE THE ABOVE SECTION

CONFIDENTIAL INFORMATION SUBMITTED IN RESPONSE TO COMPETITIVE PROCUREMENT REQUESTS OF EDUCATION SERVICE CENTER REGION 8 AND TIPS (ESC8) IS GOVERNED BY TEXAS GOVERNMENT CODE, CHAPTER 552

If you consider any portion of your proposal to be confidential and not subject to public disclosure pursuant to Chapter 552 Texas Gov't Code or other law(s), **you must attach a copy of all claimed confidential materials to this COMPLETED form, name the combined PDF documents "CONFIDENTIAL", and upload the combined, confidential documents with your proposal submission**. If a document is not attached, it will not be considered confidential. The copy uploaded will be the sole indicator of which material in your proposal, if any, you deem confidential in the event TIPS/ESC 8 receives a Public Information Request. If ESC 8 receives a request, any responsive documentation not deemed confidential by you in this manner will be automatically released. For documents deemed confidential by you in this manner, ESC8 and TIPS will follow procedures of controlling statute(s) regarding any claim of confidentiality and shall not be liable for any release of information required by law, including Attorney General determination. Notwithstanding any other information provided in this solicitation or Vendor designation of certain documentation as confidential or proprietary, Vendor's acceptance of this TIPS Vendor Agreement constitutes Vendor's consent to the disclosure of Vendor's comprehensive proposal, including any information deemed confidential or proprietary, to TIPS Members. The proposing Vendor agrees that TIPS shall not be responsible or liable for any use or distribution of information or documentation by TIPS Members or any other party.

ALL VENDORS MUST COMPLETE ONE OF THE TWO OPTIONS BELOW

OPTION 1:

I DO CLAIM parts of my proposal to be confidential and *DO NOT* desire to expressly waive a claim of confidentiality of all information contained within our response to the solicitation. The attached contains material from our proposal that I classify and deem confidential under Texas Gov't Code Sec. 552 or other law(s) and I invoke my statutory rights to confidential treatment of the enclosed materials.

IF CLAIMING PARTS OF YOUR PROPOSAL CONFIDENTIAL, YOU MUST ATTACH THE SHEETS TO THIS FORM AND LIST THE NUMBER OT TOTAL PAGES THAT ARE CONFIDENTIAL.

ATTACHED ARE COPIES OF_____PAGES OF CLAIMED CONFIDENTIAL MATERIAL FROM OUR PROPOSAL THAT WE DEEM TO BE NOT PUBLIC INFORMATION AND WILL DEFEND THAT CLAIM TO THE TEXAS ATTORNEY GENERAL IF REQUESTED WHEN A PUBLIC INFORMATION REQUEST IS MADE FOR OUR PROPOSAL.

Signature_____Date 02/17/2022

---------- **OR** ----------

OPTION 2:

I DO NOT CLAIM any of my proposal to be confidential, complete the section below.

Express Waiver: I desire to expressly waive any claim of confidentiality as to any and all information contained within our response to the competitive procurement process (e.g. RFP, CSP, Bid, RFQ, etc.) by completing the following and submitting this sheet with our response to Education Service Center Region 8 and TIPS.

Signature MMm Date 07/02/2022

THIS CERTIFIES THAT

Motive Wireless Limited Liability Company

dba Motive Lighting

NMSDC
National Minority Supplier Development Council

* Nationally certified by the: **HOUSTON MINORITY SUPPLIER DEVELOPMENT COUNCIL**

*NAICS Code(s): 335122; 561720

* Description of their product/services as defined by the North American Industry Classification System (NAICS)

03/24/2022		HS18664
Issued Date		**Certificate Number**
03/31/2023	**Ying McGuire** **NMSDC CEO and President**	
Expiration Date		**Ingrid M. Robinson, President**

By using your password (NMSDC issued only), authorized users may log into NMSDC Central to view the entire profile: http://nmsdc.org

Certify, Develop, Connect, Advocate.

* MBEs certified by an Affiliate of the National Minority Supplier Development Council, Inc.®

Results

SORT: COMPANY NAME (A-Z)

or ID	Company Name	Contact Person	Mailing Address	City	State	Zip	Country	Email	Phone	HUB Eligibility	HUB Gender	Small Business	CMBL Status	HUB Status
52237600	Motive Wireless LLC	Marquis Wallace	5718 Westheimer Rd Suite 1000	Houston	TX	77057-3194	USA	info@motivelighting.com	844-766-8483	BL	M	Yes	Inactive(N)	A-Active

TRI-COUNTY REGIONAL BLACK CHAMBER OF COMMERCE

MINORITY BUSINESS ENTERPRISE PROCUREMENT PROGRAM

Motive Wireless LLC

Motive Wireless DBA Motive Lig

is duly certified as a

MINORITY BUSINESS ENTERPRISE (MBE)

CERTIFIED CATEGORIES
335129 - 335122 - 238220

CERTIFICATION NUMBER
21149148

CERTIFICATION EXPIRATION
01/21/2024

Leondria R. Thompson

Director of Minority Business Enterprise Procurement Program

Note: This certificate is the property of Tri-County Regional Black Chamber of Commerce Minority Business Enterprise Program and may be revoked should the above named firm graduate from the MBE procurement program or the firm's certification is no longer active. In addition, this certificate is valid only in conjunction with the firm's active listing in the Certified Vendors Directory of Tri-County Regional Black Chamber of Commerce certified HUB, MBE, WMBE, SBE, DBE, and ACDBE firms via the following weblink: Certified Vendors – Tri-County Black Chamber of Commerce (tricountyregionalblackchamber.org)

MOTIVE LIGHTING

MADE IN HOUSTON, TEXAS
MOTIVE LIGHTING

HUB
Statewide Historically Underutilized Business Program

MOTIVE LIGHTING AIR GUARDIAN®

Providing air purification for a healthy environment to Students and Staff in classrooms and office locations.

EPA · WELL · CDC · World Health Organization · FDA REGISTERED · IUVA · RoHS compliant · IoT READY · Illuminating · GSA Advantage!

Air Guardian Plus® is the only device in the world that can provide continuous surface (Optional) and air disinfection. The Air Guardian is patent approved and can be used safely in occupied spaces to prevent Bacteria, Mold, and Viruses from spreading, including Covid (All Strains of Covid)

An integrated device platform of Air Guardian® and CleanWhite®. A single Air Guardian® Plus device can completely change and disinfect room air every few minutes while continuously destroying surface pathogens. Air Guardian® Plus functions can be controlled manually or automatically, using Vertices sensor technology – including CleanWhite® lumen strength, antimicrobial dose, and periodicity of use.

CHECK OUT OUR VIDEO TO LEARN MORE

https://www.youtube.com/watch?v=4jvhdvitTJY

CHECK OUT OUR VERTICES APPLICATION VIDEO

https://drive.google.com/file/d/1Ivf-h5o0Z_VxOLqBs-3YyqwajcjfMR9S/view

CERTIFICATIONS:

- **CE, ETL, RoHS**
- **Patent Approved**
- **FDA Facility #10077990**
- **EPA Establishment # 98105-TX-1**
- **FDA Medical Device Classification**
  Device Class 2 Listing #D420497

MOTIVE LIGHTING

MADE IN HOUSTON, TEXAS
MOTIVE LIGHTING

Certified MBE Minority Business Enterprise

KR BIOTECH
KR Biotech Co., Ltd.
Institute of Infectious Disease Control
Neungdong-ro 120, Konkuk university
Bld#12, Rm 406, Kwangjin-gu, Seoul

Test Report

Client	Personnel	Jae Hak Jeong	Tel. No.	82-70-4391-8629
	Affiliation	SEOUL VIOSYS Co., Ltd.	E-mail	Jaehak.jeong@seoulviosys.com
	Address	65-16, Sandan-ro, 163beon-gil, Danwon-gu, Ansan-si, Gyeonggi-do, Republic of Korea		
Request	Virucidal Activity Test by UV Irradiation			
Product	UVC module (100mW)			
Purpose of Use on the Product	Sterilization			
Test Virus	COVID-19 (SARS-CoV-2)		Cell Line	Vero E6
Test No.	KR-2011-065-SVS-01		Test Period	2020.11.20-12.01
Treatment time	1, 3, 5 sec		Titration	CPE
Test Temperature	Room Temperature (Approx. 20°C)		Tester	Hansam Cho

Test Result

Product Name	Virus Titer $TCID_{50}$	Treatment time	Distance	Virus Reduction Rate	
				(log)	(%)
UVC module (100mW)	$2.15x10^7$	1 sec	2 cm	2.250	99.437 %
		3 sec		2.583	99.739 %
		5 sec		2.751	99.823 %

Result: As a result of the sterilization test for COVID-19 (SARS-CoV-2) by UV generated in the UVC module (100mW) of SEOULVIOSYS Co., Ltd., it showed 99.437%, 99.739% , and 99.823% virucidal effect in 1, 3, and 5 seconds, respectively treatment at a distance of 2 cm.

December 04, 2020

Test Manager: Young Bong Kim (Seal)

KR BIOTECH Co., Ltd.

* This test report is a result limited to the sample and sample name provided by the client and does not guarantee the quality on the overall product.
* This report cannot be used for PR, advertising and litigation purposes, and use of this report other for its original purpose is prohibited.

EPA WELL CDC World Health Organization FDA REGISTERED IUVA ULTRAVIOLET ASSOCIATION RoHS compliant IoT READY Illuminating ENGINEERING SOCIETY GSA Advantage!

Air Guardian Enclosed UVC Disinfection Air Chamber

Patent pending, sealed chamber with intense multi-modal actions Removes pathogens, particulates, voe, and pollutants Precision-engineered airflow displacement

AIR GUARDIAN 4-TIER PROTECTION:

1. Air enters TiO2 ceramic filter inlet.
2. Air travels through proprietary coated chamber excited with UVA.
3. Air travels through linear chambers and becomes exposed to large surface areas excited with UVC.
4. Air is dual filtered through (HEPA-like) super-micron and carbon filters.

Pure air displaced into protected areas
Unmatched single-pass purification

FEATURES:

- Protects human health without the use of harmful chemicals or materials . Heterogeneous filtration deodorizes and improves overall air quality by removing particulates, pathogens, and pollutants.
- Emits No Ozone or chemical compounds; Multi-level filtration may help people in relieving symptoms of allergies to dust, mold, spores, and other allergens.
- Filter and chamber work to kill airborne pathogens (including SARS-CoV- 2, the virus that causes COVID-19), spores and any other living organism which passes through. Effective against MRSA. C. Difficile, Salmonella, E. Coli, and other pathogens.

Available in both 2' x 2' and 2' x 4' sizes. Aluminum Housing. Exhaust kits available in multiple sizes: 8' 112· [24'

CERTIFICATIONS:

- CE, ETL, RoHS
- Patent pending
- FDA Facility #1007799 0
  EPA Establishment# 98105-TX-1
  FDA Medical Device
  Classification Device Class 1
  Listing #D 420497

WARRANTY:

- UVA & UVC LED circuits: 30,000 hrs
- Fans: 3 years
- Driver: 5 years
- Chamber Housing: 25 years

APPLICATIONS:

Suitable for most commercial and institutional applications. May be placed in room, plenum or return duct. IoT available (Internet of Things)

- Hospitals
- Office
- Retail
- Schools & Universities
- Healthcare Facilities
- Labs and Clinics

SPECS:

	2x 2		2x 4
Weight (lb)	10.65	I	24
Amps (!10%)	.75	|	1.5
Wattage	38	|	80
Decibels*	51	|	6 4
Voltage	122~ 277		

**variable speed available. Adjustable option affects decibel level.*

Project_____
Location_____
Cat.#_____
Type: _____
Quantity: _____

Total exposed surface area of Ti02
(UVC disinfection) within Air Guardian:

- 2 x 2: >19 sq. ft. - 2 x 4: >63 sq. ft.

UVC excited disinfection chamber length
in which air is passed through Air Guardian:

- 2 x 2: >18 linear ft. - 2 x 4: >28.7 linear ft.

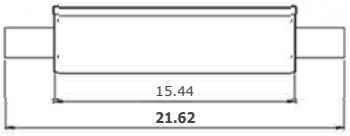
** All viruses are known to be affected by UVC, however, inactivation time varies from virus to virus.*

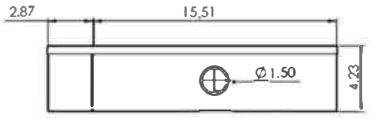
Unmatched single-pass purification
Pure air displaced into protected areas
Precision-engineered airflow displacement

Removes pathogens. particulates. *VOC.* and pollutants
Patent pending, sealed chamber with intense multi-modal actions

Air Guardian Enclosed UVC Disinfection Air Chamber

ANTI-MICROBIAL |ANTI-VIRAL

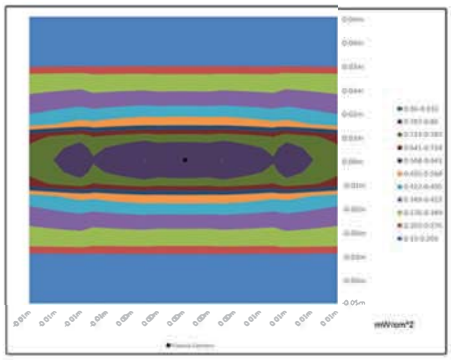




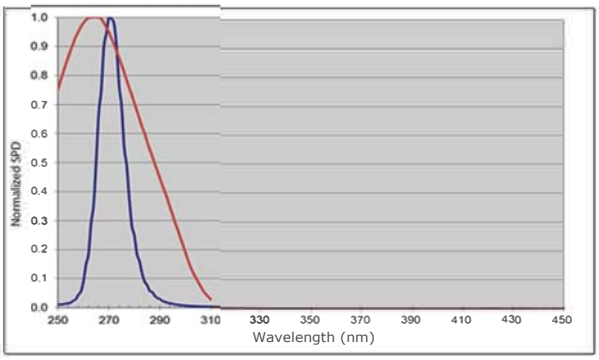
Total Flux	15.700	mW
FWHM viewing angle	130.00	deg
Distance	1.0000	in
On time	19.00	s
Ootical Efficiencv	100.00	%
Light source type	Point Source	
Simulation Surface	4.0000	in
Length Simulation	1.0000	in
Surface Width		
Number of fixtures	Go To Fixture Placement Tab	
Flux Unit	mW	
Energy Unit	mJ	
Area Unit	cm^2	
Average irradiance of Array	0.3767	mW/cm^2
Average dosage of Array	7.1572	mJ/cm^2
Peak irradiance of Array	0.8624	mW/cm^2
Peak dosage of Array	16.3853	mJ/cm^2

1 UVC LED @ 1 • OF 1 fin of 6 of 4 chambers
Distance = 1 ", Height = 4", Width = 1 •

IRRADIANCE DISTRIBUTION



SYSTEM SPECTRUM & IRRADIANCE RESULT



**All viruses are known robe affected by WC. however. inactivation tirne varies from virus to virus.*

Purification Results

Wall Reflectance	90%[1]	Irradiance	Min: 0.136, Max: 0.862 0.3767	mW/cm^2	
Simulate Chamber		Adjusted Irradiance	0.330	mW/cm^2	
		Time	19.000	s	
		Adjusted Dosage	6.267	mJ/cm^2	
1st bounce contribution	41%	% Reduction at system dosage	Time required for % reduction of original population		Target
2nd bounce contribution	10%		2 log (99%)	4 log (99.99%)	6 log (99.9999%)	80.00%
Bacteria						
Acinetobacter baumannii[6]		99.4039%	17s	34s	51s	6s
Bacillus anthracis - Anthrax[1]		97.9475%	23s	45s	1m 7s	8s
Bacillus anthracis spores - Anthrax spores[1]		51.8957%	1m 59s	3m 59s	5m 58s	42s
Bacillus megaterium sp. (spores)[1]		99.8499%	13s	27s	40s	5s
Bacillus megaterium sp. (veg.)[1]		99.9999%	6s	13s	19s	2s
Bacillus paratyphosus[1]		99.6083%	16s	32s	47s	6s
Bacillus subtilis spores[1]		78.4927%	57s	1m 53s	2m 50s	20s
Bacillus subtilis[1]		95.3743%	28s	57s	1m 25s	10s
Clostridium difficile[5]		78.4927%	57s	1m 53s	2m 50s	20s
Corynebacterium diphtheriae[1]		99.4447%	17s	34s	51s	6s
Ebertelia typhosa[1]		99.9738%	11s	21s	32s	4s
Escherichia coli[1,2]		99.4039%	17s	34s	51s	6s
Leptospiracanicola - infectious Jaundice[1]		99.6429%	16s	31s	47s	5s
Micrococcus candidus[1]		93.5989%	32s	1m 3s	1m 35s	11s
Micrococcus sphaeroides[1]		88.8685%	40s	1m 19s	1m 59s	14s
Mycobacterium tuberculosis[1]		96.5983%	26s	52s	1m 17s	9s
Neisseria catarrhalis[1]		98.1268%	22s	44s	1m 5s	8s
Phytomonas tumefaciens[1]		98.5391%	21s	41s	1m 2s	7s
Proteus vulgaris[1,2]		99.4039%	17s	34s	51s	6s
Pseudomonas aeruginosa[1,2]		96.0041%	27s	54s	1m 21s	9s
Pseudomonas fluorescens[1]		99.4039%	17s	34s	51s	6s
Salmonella enteritidis[1]		98.8305%	20s	39s	59s	7s
Salmonela paratyphi - Enteric fever[1]		99.6083%	16s	32s	47s	6s
Salmonella typhosa - Typhoid fever[1]		99.9738%	11s	21s	32s	4s
Salmonella typhimurium[1]		89.1855%	39s	1m 18s	1m 58s	14s
Sarcina lutea[1]		72.2142%	1m 8s	2m 16s	3m 24s	24s
Serratia marcescens[1]		99.5866%	16s	32s	48s	6s
Shigella dysenteriae - Dysentery[1]		99.9681%	11s	22s	33s	4s
Shigella flexneri - Dysentery[1]		99.9952%	9s	18s	26s	3s
Shigella paradysenteriae[1]		99.9952%	9s	18s	26s	3s
Spirillum rubrum[1]		99.5866%	16s	32s	48s	6s
Staphylococcus albus[1]		99.7290%	15s	30s	44s	5s
Staphylococcus aureus[1,2]		99.4039%	17s	34s	51s	6s
Staphylococcus hemolyticus[1]		99.7860%	14s	28s	43s	5s
Staphylococcus lactis[1]		97.8548%	23s	46s	1m 8s	8s
Stenotrophomonas maltophilia[1]		97.2973%	24s	48s	1m 12s	8s
Streptococcus viridans[1]		99.9863%	10s	20s	30s	3s
Vibrio comma - Cholera[1]		99.4491%	17s	34s	50s	6s
Molds						
Aspergillius flavus[1]		28.9301%	4m 16s	8m 32s	12m 48s	1m 29s
Aspergillius glaucus[1]		31.9001%	3m 47s	7m 35s	11m 23s	1m 19s
Aspergillius niger[1]		9.7378%	14m 14s	28m 28s	42m 42s	4m 58s
Mucor racemosus A[1]		61.7293%	1m 31s	3m 2s	4m 33s	32s
Mucor racemosus B[1]		61.7293%	1m 31s	3m 2s	4m 33s	32s
Oospora lactis[1]		95.3743%	28s	57s	1m 25s	10s
Penicillium expansum[1]		78.4927%	57s	1m 53s	2m 50s	20s
Penicillium roqueforti[1]		72.2142%	1m 8s	2m 16s	3m 24s	24s
Penicillium digitatum[1]		31.9001%	3m 47s	7m 35s	11m 23s	1m 19s
Rhisopus nigricans[1]		14.2452%	9m 29s	18m 58s	28m 28s	3m 18s
Protozoa						
Chlorella Vulgaris[1]		78.4927%	57s	1m 53s	2m 50s	20s
Nematode Eggs[1]		30.7530%	3m 58s	7m 56s	11m 54s	1m 23s
Paramecium[1]		81.5564%	52s	1m 43s	2m 35s	18s
Virus						
Bacteriophage - E. Coli (MS2)[1]		99.4039%	17s	34s	51s	6s
Coronavirus (SARS-CoV-2)[4]		99.8843%	13s	26s	39s	5s
Infectious Hepatitis[1]		98.5391%	21s	41s	1m 2s	7s
Influenza[1]		99.4039%	17s	34s	51s	6s
Poliovirus - Poliomyelitis[1]		99.4039%	17s	34s	51s	6s
Tobacco mosaic[1]		7.3961%	18m 58s	37m 57s	56m 56s	6m 37s
Yeast						
Brewers yeast[1]		99.4039%	17s	34s	51s	6s
Candida albicans[3]		92.9981%	33s	1m 5s	1m 38s	12s
Common yeast cake[1]		92.2795%	34s	1m 8s	1m 42s	12s
Saccharomyces carevisiae[1]		92.2795%	34s	1m 8s	1m 42s	12s
Saccharomyces ellinsoideus[1]		92.2795%	34s	1m 8s	1m 42s	12s
Saccharomyces spores[1,2]		85.3535%	46s	1m 31s	2m 16s	16s

Air Guardian® and CleanWhite®
Air Purification, Air Disinfection, Surface Disinfection
A One-Page Primer for Schools

For schools and academic facilities, motiveLighting's Solution Suite provides air and surface disinfection, air purification, air quality monitoring, air quality management, and room/space-focused student and occupant protection.

All schools have elements in classrooms and other areas that can affect air quality. Scientists have identified the links between air quality and health - including chronic, acute, and infectious diseases. Of course, COVID disease and SARS-CoV-2 are now a primary concern, but future viral and antimicrobial-resistant threats must also be considered.

Air Guardian® and CleanWhite® are biotechnology solutions that use proven science in their most highly advanced forms. Unlike many devices which have been repurposed to use for disinfection in the COVID era, motiveLighting solutions were first designed in 2020 and continually enhanced since then for use against today's challenges and threats.

motiveLighting Solution Suite capabilities

The motiveLighting Suite is the only solution in the world that can simultaneously purify and disinfect air and surfaces to protect a classroom or other academic space. Air Guardian® is a sealed device that uses an array of forces, including intense UV-C and oxidation energies, to destroy all microbial pathogens within sub-seconds, including SARS-CoV-2. These same forces eliminate harmful particles and reduce hazardous chemicals.

Purified air is released from multiple vents, constantly displacing and replacing in a downward fashion, creating safer air in occupant breathing zones – and helping to prevent microbial cross-contamination.

CleanWhite® LEDs continuously and safely disinfect surfaces using patented white-illuminating technology.

Limitations and Misconceptions of Existing Air Filters

Despite claims from vendors that rely on HEPA to "trap" particles and microbes, HEPA air filters are only able to filter particles as small as 0.3 microns, with claims (often disputed) to trap particles of 0.10 microns. At 0.067 microns, HEPA cannot remove the most infectious SARS-CoV-2 particles. Most scientists consider the accumulation of trapped pathogens embedded in HEPA filters to be a source of hazardous environmental contamination.

Portable HEPA filters typically vent air in such a way that they not only aerosolize settled microbes but they also can cross-contaminate by moving across the breathing zone. In those that contain UV-C lamps, air moves too fast across the lamps to effectively kill microbes in a single pass. Some may be trapped, but ultrafine and nanoparticles will pass through the filter.

Portable HEPA-based air filtration devices have a limited ability to process air beyond a specific circumference around the device. While this varies by device and fan speed, it is a key limitation in a HEPA-based device. Even with multiple devices, the venting process may induce contagion.

WHITE PAPER: AIR GUARDIAN®

An innovative air and surface disinfection solution that makes every space safer

Executive Summary

This white paper is an evidence-based evaluation and description of the technologies, mechanisms, and design of the Air Guardian Solution.

1) It will demonstrate that the Air Guardian® device provides for the **purification, disinfection, and filtration of airborne** pathogens, particles, harmful chemicals, and pollutants.
2) It will identify **how Air Guardian's technology is scientifically based**, proven, and used effectively today in other use cases and applications.
3) It will identify and explain the **technology used to enable the CleanWhite™ solution to kill or inactivate microbial pathogens**, primarily on surfaces but also in ambient air.
4) It will provide **supporting material to the claims made herein**, including laboratory and academic studies, test results, and peer-reviewed literature.
5) The statements made herein about Air Guardian® are additionally supported by **computational and laboratory testing**.
6) For evidence that Air Guardian's **specific technology is capable of inactivating SARS-CoV-2**, laboratory testing includes use of the MS-2 bacterial phage virus as well as the SARS-CoV-2 virus (at the Korea University) in an approved Biohazard Laboratory.
7) **CleanWhite efficacy** is additionally supported by measurements and outcomes at existing, installed client sites.

This paper will thus prove the safety, efficacy, and value, and need for the Air Guardian solution and its component innovations. It is the author's further intent to illustrate the importance and need for Air Guardian technology in the context of the COVID-19 (SARS-CoV-2) era.

AIR GUARDIAN®

Quick links to contents

i. General

Recommendations and minimal requirements for disinfection vary. Some are based upon the specific use case, such as those offered by healthcare's Joint Commission[1], The Centers for Disease Control[2] (and Opening up America Again in conjunction with the US Government)[3], IAQ oversight groups, ASHRAE[4], REHVA, EPA, FDA, FIFRA, and APIC.

For information about Air Guardian® 's alignment and compliance with regulatory agencies, see https://www.motivelighting.net and EPA, FDA, IUVA, ETL, and other information here:

ii. Certifications

CE, ETL. RoHS, IUVA
Patent Approved (Air Guardian, Immaculight)
FDA Facility #10077990
EPA Establishment# 98105-TX-1
FDA Medica Device Classification: Device Class II - Listing #D420497

Other certifications include:

Additional regulations, policies, procedures, and guidelines are often seen in specific use-case settings - such as classrooms, air travel, oncology, pediatric, dental, dialysis, intensive care, operating rooms, clean rooms, and other areas.

To accurately measure the effect of any infection prevention or air quality intervention, organizations are challenged by the many variables that affect outcomes. Laboratory testing in controlled settings is a simulation that is, without exception, achievable in real-world environments that introduce instantaneous, constantly changing variables.

It is important, therefore, to understand how real-world variables affect the reliability and efficacy of any intervention - whether the method is ventilation, PPE, distancing, air filtration, HVAC duct disinfection, UVGI, fluid dynamics, pressurized spaces, or any other mitigation strategy.

[1] https://www.jointcommission.org/resources/patient-safety-topics/infection-prevention-and-control/compendium-of-strategies-to-prevent-healthcare-associated-infections/
[2] https://www.cdc.gov
[3] https://www.whitehouse.gov/openingamerica/
[4] https://www.achrnews.com/articles/143009-discussing-the-cdc-and-ashrae-recommendations-for-hvac-systems

MOTIVE LIGHTING PRODUCTS

Easy and Comprehensive guide to our unique products and how they work.

Four Device Models

MotiveLighting Air Guardian® provides for complete air disinfection, including purification, filtration, and destruction of chemical contaminants. This may also be known by a distributor-branded name.

The four separate devices are Air Guardian®, Air Guardian® Plus, which includes CleanWhite™, and CleanWhite™, without the Air Guardian® component, and the Air Guardian Portable Unit.

The four models of the fixture are shown below:

Air Guardian®

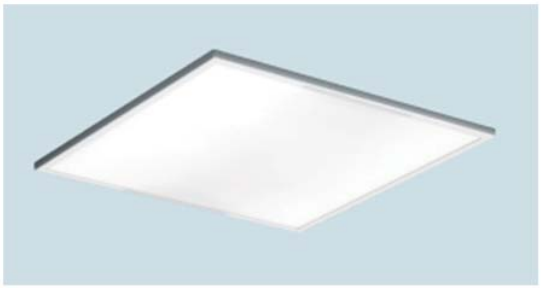
Air Treatment Technology

Air Guardian continuously neutralizes pathogens and purifies air.
It provides complete air purification, including disinfection, filtration, and destruction of chemical contaminants.
Air Guardian produces frequent room air changes and protective airflow in any space.

Air Guardian® Plus

Dual-Modality Air + Surface Disinfection Technology

Combines Air Guardian and CleanWhite in a single fixture to provide both surface and air disinfection.
Both Air Guardian and Air Guardian Plus offer integrated, real-time monitoring of indoor air quality with mobile app and dashboard.



CleanWhite™

Continuous Surface Disinfection

CleanWhite provides continuous surface disinfection using patented, antimicrobial white-illuminating LEDs which destroy over 99% of surface microbes, including bacteria, spore forms, fungi, mold, and other harmful pathogens.

Air Guardian Portable™

Continuous Surface Disinfection

This fixture allows the Air Guardian to become a mobile unit for any area where a permanent Air Guardian may not be appropriate. It serves an easy 3-piece assembly and is coated in our propriety TIO2 technology, ensuring that the exterior of the fixture remains germ and microbe-free throughout its lifetime.

i. Motive Lighting Air Guardian®

In the center of the LED fixture is the air intake chamber, into which air is continuously inducted from fan(s) located at the end of the serpentine chambers within the device.

In this model of the fixture, there are four 50 CFM fans, which draw air into four separate chambers within the sealed fixture.

The intake rate in cubic feet per minute is 100 ft3 /min for a 2' x 2' fixture or 209 ft3/min for a 2' x 4' fixture.

The 2' x 2' unit covers approximately 400 square feets while the 2' x 4' unit covers approximately 800 square feets.

The inflow of air is first passed through a sealed chamber (fig. 2), which can be located above the fixture in the plenum space. The fixture can also be suspended, ceilingmounted, or used withalternate design modalities if needed.

Air Guardian™

Air Treatment Technology

Air Guardian continuously neutralizes pathogens and purifies air.
It provides complete air purification, including disinfection, filtration, and destruction of chemical contaminants.
Air Guardian produces frequent room air changes and protective airflow in any space.

ii. Motive Lighting Air Guardian® Plus

Motive Lighting Air Guardian® Plus includes both the Air Guardian® air purification and disinfection fixture as wellas an integrated form of the CleanWhite™ surface disinfection solution.

Note that the CleanWhite™ LED panel must accommodate for the intake airflow vent in the fixture when it becomes part of the Air Guardian® Plus solution.

Also available in 2' x 2' and 2' x 4' units. The 2' x 2' unit covers approximately 400 square feets while the 2' x 4' unit covers approximately 800 square feets.

Air Guardian™

Air Treatment Technology

Air Guardian continuously neutralizes pathogens and purifies air.
It provides complete air purification, including disinfection, filtration, and destruction of chemical contaminants.
Air Guardian produces frequent room air changes and protective airflow in any space.

iii. Motive Lighting CleanWhite®

The functional component that emits energy wavelengths in the visible (non-UV) light spectrum and is capable of the continuous surface disinfection described herein.

CleanWhite™ is a patented solution that is typically not rebranded by distributors or channels.
CleanWhite™ is available as a separate fixture which can be used as a standalone disinfecting LED panel.

Or, as stated above, as an integrated component of an Air Guardian® Plus device.

Reflective ceiling designs and proposals which incorporate both surface and air purification will often include more standalone CleanWhite panels (as a fixture model) than those that are integrated as a part of the Air Guardian® Plus fixture.

Also available in 2' x 2' and 2' x 4' units. The 2' x 2' unit covers approximately 400 square feets while the 2' x 4' unit covers approximately 800 square feets.

This is primarily due to the difference in the scope of the surface area illumination compared to the fluid dynamic principles of room air disinfection.

Air Guardian™

Air Treatment Technology

Air Guardian continuously neutralizes pathogens and purifies air.
It provides complete air purification, including disinfection, filtration, and destruction of chemical contaminants.
Air Guardian produces frequent room air changes and protective airflow in any space.

iv. Motive Lighting Air Guardian® Portable

Fixture allows for continuous and mobile disinfection of air.

This fixture allows the Air Guardian 2'X2' to become a mobile unit for any area where a permanent Air Guardian may not be appropriate.

The fixture arrives as an easy 3-piece assembly and is coated in our propriety TIO2 technology, ensuring that the exterior of the fixture remains germ and microbe-free throughout its lifetime.

Air Guardian™

Air Treatment Technology

Air Guardian continuously neutralizes pathogens and purifies air.
It provides complete air purification, including disinfection, filtration, and destruction of chemical contaminants.
Air Guardian produces frequent room air changes and protective airflow in any space.

v. Application of Science, Technology, and Research

motiveLighting's ongoing approach to designing and enhancing Air Guardian® is to leverage and align multiple modalities of innovation with proven science. By incorporating the various technologies outlined here, as well as the application of discoveries found within physical, chemical, and natural science disciplines, Air Guardian® is much more than a UV-C light and a micron filter.

Air Guardian is also designed as a fixture which considers the pragmatic challenges of air purification and disinfection in any space or building. To provide for the highest level of occupant safety in a given space, one must accept the limitations and real-world variables of that space and its use-case purpose.

To form a complete picture of how safety relative to indoor air quality, preventing infectious disease transmission, infection and prevention, one must consider the applicable knowledge in each area. Several scientific disciplines contribute to Air Guardian® design, including computational bio-modeling, cellular function, genomics, organic and inorganic chemistry, computational biophysics, computational airflow dynamics, photo-physics, environmental biology, microbiology, turbulent airflow, Brownian movement within airflow, electrical engineering, HVAC systems, immunology, virology, and infectious disease.

The variables that affect disease transmission, infection prevention, air quality, biosafety, and safety are found within the realms of these disciplines.

This is important because each physical space needs to be protected - and each space is different. Most spaces have a different use case or purpose. With that purpose, each space is its unique environment. And each room will have a myriad of possible variations, from airflow dynamics, ventilation, age, furnishings, occupants, previous occupants, building materials, proximity to other rooms, occupancy numbers, plumbing, adjoining rooms, etc.

Each of these differences is a variable. Infection prevention specialists, indoor air quality experts, architects, plumbers, builders, microbiologists, chemists, engineers, and epidemiologists all recognize individual hazards and threats. Some hazards can be significant, perhaps unknown to tenants, occupants, patients, students, or staff.

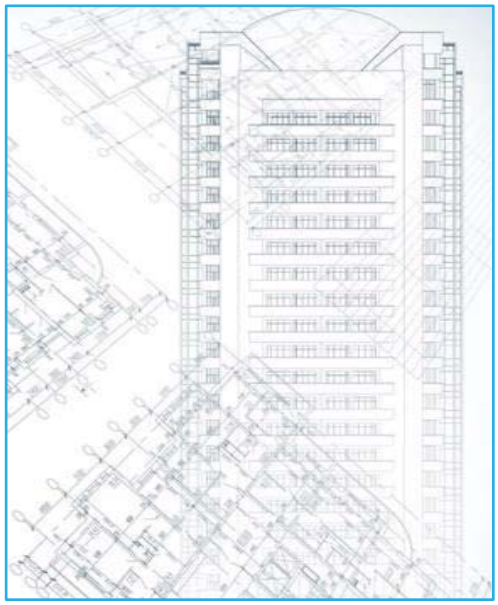
The goal is to solve for the variables.

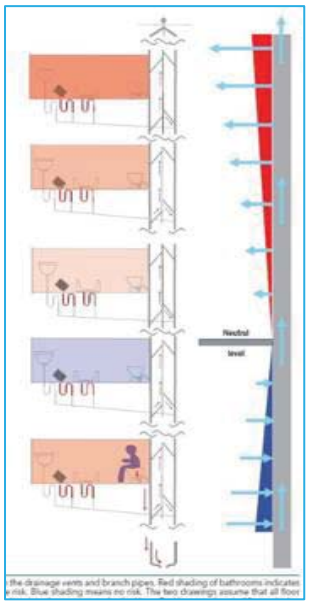
vi. Discoveries in SARS-CoV-2 disease transmission

In February 2020, in Guangzhou, China, researchers discovered that several people who had been socially isolating in their apartments were infected through fecal aerosols even though they were

up to 12 floors apart in distance[5]. And, in 2003, in much the same fashion, fecal aerosols containing the SARS-Cov-1 virus were found to have infected more than 300 people in an apartment in Amoy Gardens[6].

Solving for the variable that caused the infection required significant re-engineering and modification of plumbing, draining, venting, and HVAC systems. Only aggressive, fast, room air changes to remove all contaminated air from the space would prove a modicum of safety before the construction and engineering work was to be completed.





Higher floors were shown to be more prone to infectious fecal aerosols

[5] Probable Evidence of Fecal Aerosol Transmission of SARS-CoV-2 in a High-Rise Building
Min Kang, Jianjian Wei, Jun Yuan, Juxuan Guo, Yingtao Zhang, Jian Hang, Yabin Qu, Hua Qian, Yali Zhuang, Xuguang C hen, Xin Peng, Tongxing Shi, Jun Wang, Jie Wu, Tie Song, Jianfeng He, Yuguo Li, and Nanshan Zhong Annals of Internal Medicine 0 0:0

[6] 17. Yu IT, Li Y, Wong TW, et al. Evidence of airborne transmission of the severe acute respiratory syndrome virus. N Engl J Med. 2004;350:1731-9. [PMID: 15102999]

vii. Airflow Dynamics

A major variable is in disease transmission and infection prevention is within the science of airflow dynamics. This is possibly the most important but the least publicly understood variable. The dynamics are complex and include temperature convections, positive and negative pressures, HVAC venting location and pressure, door and window locations and use, object displacement, and other factors.

A recent statement regarding SARS-CoV-2 from the CDC[7] stated the following:

> "Directional Airflow is a **protective ventilation concept** where air movement flows in a clean-to-less-clean direction. This ventilation concept is applied to areas where the "clean" environment requires a higher level of protection and/or where the "less-clean" environment has a higher risk of containing airborne contaminants (activities or occupancy by individuals with a higher risk of being infectious).
>
> Examples of "clean" spaces might include healthcare facility triage stations or rooms/corridors adjacent to higher risk activities. Examples of "less-clean" spaces might include spaces that contain known/suspect infectious persons or spaces where a known activity has increased likelihood of generating infectious airborne particles.
>
> The creation of directional airflow can be accomplished **within a particular space or between two adjacent spaces**. This can be done passively, through intentional placement of supply and exhaust heating, ventilation, and air conditioning (HVAC) grills or by the intentional creation of pressure differentials between adjacent spaces through specification of offset exhaust and supply air flow rates. Creation of the directional airflow can also be done actively, through the use of fans exhausting through open windows, strategic placement of ductwork attached to portable HEPA filtration units, or dedicated exhaust systems (installed or portable) that generate a desired airflow by exhausting air out of windows, doorways, or through temporary ducts. **In specific settings, specialized local control ventilation interventions that establish the desired airflow directions can also be used."**

> "UVGI can be used as a supplemental treatment for disinfection of air in HVAC systems or above people in occupied spaces (upper-room or upper-air systems) and for supplemental disinfection of surfaces following routine cleaning and disinfection. UVGI, also known as Germicidal Ultraviolet (GUV), uses ultraviolet energy in the UV-C band (wavelengths of 220-280 nanometers), which is effective against SARS-CoV-2 under laboratory conditions. Efficacy of the applied dose (a function of irradiance and time) is highly dependent on many factors, such as the concentration of the virus, inoculum size (in experimental studies), the virus medium, contours and type of material being treated, as well as what the virus is

[7] https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/surface-transmission.html

suspended in (e.g., culture media, respiratory droplets, other proteinaceous material). These complex variables may explain the range of results presented in the published literature."

Protectional airflow designs are often used in hospital operating rooms - including positive pressure anterooms, laminar airflows, separate air treatment systems with high MERV and HEPA filtered air, and even downward, highly treated airflow across the surgical space - which can be described as personal protective airflow.

viii. HVAC and cross-ventilation contamination

In another well-known 2020 study, again in Guangzhou, China, it was demonstrated how airflow caused droplets and fine particles of shed virus to infect other customers at distances well beyond social distance recommendations. The figure below illustrates how HVAC airflow spread viral particles from two infected persons to tables on the other side of the room, infecting eight other people.

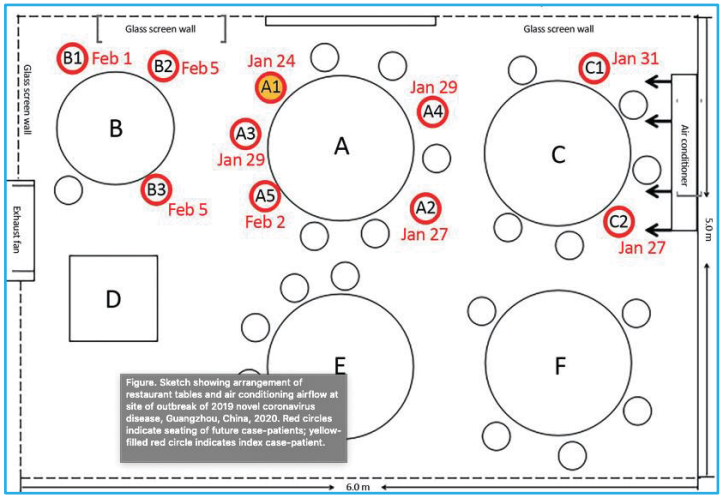


Figure. Sketch showing arrangement of restaurant tables and air conditioning airflow at site of outbreak of 2019 novel coronavirus disease, Guangzhou, China, 2020. Red circles indicate seating of future case-patients; yellow-filled red circle indicates index case-patient.

To learn more about this case, as well as the study that followed, link to:

https://bit.ly/3uPUZ0q

In a related study, it was proposed that there are three key elements of ventilation related to the transmission mechanism and the risk estimation of airborne infection. It postulated that **ventilation rate, flow direction, and airflow pattern most strongly influence the risk of airborne infection**.[8]

[8] Qian H, Zheng X. Ventilation control for airborne transmission of human exhaled bio-aerosols in buildings. *J Thorac Dis*. 2018;10(Suppl 19): S2295-S2304. doi:10.21037/jtd.2018.01.24

This study is critical to demonstrate the novel design of the Air Guardian solution. **The ability to create safe, clean zones of air was shown to be critical (similar to what was described in an operating theater), along with the aggressive ingestion of droplet nuclei and airborne particles in upper room air.**

Hua Qian, et al., described the mechanism of airborne transmission relative to risk:

"Transmission of infectious diseases occurs when the pathogen or agent leaves the source and spreads by one or more routes of transmission to the susceptible. Droplet spread and airborne transmission are two main routes to transmit respiratory diseases.

Droplet spread refers to the passage of pathogens from a source to a susceptible [host] through large droplets. It was calculated that droplets of greater than 100 m in diameter released from a height of 2 m deposited on the floor within 3–6 s with less than 1.5 m in the horizontal distance at room air temperature and relative humidity of less than 60%, while droplets of less than 100 m evaporated within 3–6 s. [Therefore] droplet-borne transmission is a short-range process, with a distance less than 2 m due to the evaporation and high settling velocity of large droplets.

Airborne transmission refers to the passage of pathogens from a source to a susceptible host through airborne aerosols, resulting in infections. The vehicle of airborne transmission is droplet nuclei, the residues of dried-out droplets, which can suspend in the air for a long time and transmit over a long distance.

Liu et al. investigated the interpersonal exposure of exhaled droplets and droplet nuclei between two standing thermal manikins affected by different factors, i.e., distance, temperature, and humidity.

Results showed that the mechanisms of transmission for droplet-based, short-range infections and longer-range airborne infections are both possible, although short-range transmission probabilities were higher.

Thus, as is well understood by most researchers today (April 2021), while short-range transmission had a much higher risk than long-range transmission does**, both must be mitigated as changing variables based, not only on airflow and ejection mode (breathing, shouting, sneezing, coughing, physical exertion, etc.) but also, in the case of SARS-CoV-2, on the type of viral variant.**

For example, the variant B.1.1.7 variant has been proven significantly more contagious and transmissible than wild-type SARS-CoV-2[9], in part because of the higher rate and volume of viral shedding.

In alarming recent studies[10], it was found that most current SARS-CoV-2 vaccines (Pfizer) cannot predictably prevent infection with the P.1 strain.

Thus, neither social distancing nor even current vaccinations that prevent wild-type SARS-CoV-2 infections cannot be relied upon as an effective mitigation strategy.

We must continue to solve for transmission variables, such as airflow, ejection pressure, viral variant, and volume of viral shedding.

It has been repeatedly shown that while somewhat helpful, social distancing of six feet will not, by itself, prevent droplet or micro-droplet airborne transmission.

[9] Galloway SE, Paul P, MacCannell DR, et al. Emergence of SARS-CoV-2 B.1.1.7 Lineage — United States, December 29, 2020–January 12, 2021. MMWR Morb Mortal Wkly Rep 2021;70:95–99.
DOI: http://dx.doi.org/10.15585/mmwr.mm7003e2external icon.

[10] https://www.timesofisrael.com/real-world-israeli-data-shows-south-african-variant-better-at-bypassing-vaccine/

ix. The Wells-Riley Infection Equation with regard to Ventilation

Regarding the importance of ventilation, which can be expressed in the most general terms as clean air entering the room and contaminated air leaving the room (whether by mechanical or passive means (such as open windows) - we have the Wells-Riley equation.

"The impact of ventilation rate on the cross-infection of airborne transmitted diseases can be described by the Wells-Riley Equation. Wells introduced an idea of quantal infection to describe the necessary dose of pathogens to cause infection to a new susceptible (15). Based on this assumption and Poisson distribution, the infection possibility was derived by Riley (39), which is called the Wells-Riley equation, to predict the risk of airborne infection" [11]

$$P = \frac{C}{S} = 1 - exp\left(-\frac{Iqpt}{Q}\right) \quad [1]$$

where P is the risk of cross infection, C is the number of case to develop infection, S is the number of the susceptible, I is the number of infectors, p is the pulmonary ventilation rate of each susceptible (m^3/h), Q is the room airflow rate (m^3/h), q is the quanta produced by one infector (quanta/h), and t is the duration of exposure (h).

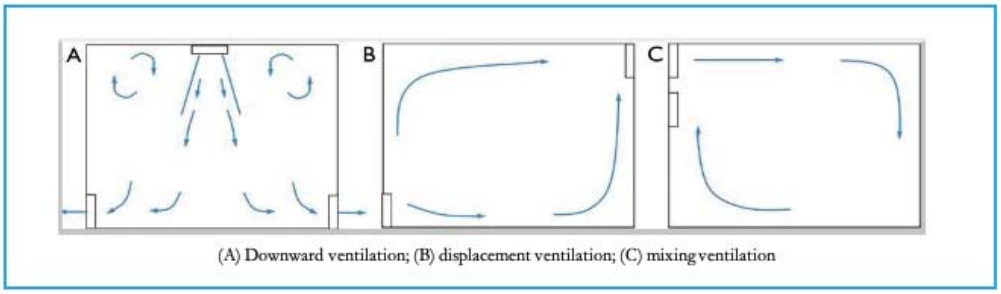
The Wells-Riley equation successfully predicted a measles outbreak in a suburban school in USA (39). The equation and its improvements have been widely used to predict outbreaks of airborne infections and even to study the association between sick leave and ventilation system (40-43). The equation indicates that ventilation rate can reduce the infection risk significantly.

Here, one can see that a key determination is Q, the room ventilation rate, expressed in cubic meters per hour. The risk is higher when the ventilation is lower. But the higher the viral contagion, expressed as Iqpt, theoretically the ventilation rate must increase for the risk to decrease.

$$P = \frac{C}{S} = 1 - exp\left(-\frac{Iqpt}{Q}\right)$$

[11] Qian H, Zheng X. Ventilation control for airborne transmission of human exhaled bio-aerosols in buildings. *J Thorac Dis*. 2018;10 (Suppl 19): S2295-S2304. doi:10.21037/jtd.2018.01.24

To determine the type of ventilation that would offer the least infectious risk, three types were studied:



(A) Downward ventilation; (B) displacement ventilation; (C) mixing ventilation

Here again, in solving for contamination and transmission variables - how does one account for all the variables that might not be controllable or constant? Who is in the room? If they're infectious, how contagious (viral load) are they? Is the room stuffy or well ventilated? Are their cross flows of air that might carry particles and droplet nuclei toward at-risk occupants?

The main variable is the optimal application of airflow dynamics. The secondary variables are the risk of infection, particle size, the viral load (contagion), inhalation, and time. From the Qian et al. study - results:

"The results indicated that the performance of downward ventilation to remove exhaled pollutants was close to that of mixing ventilation. However, when the infector faced horizontally, the exhaled jet [breath, cough, particle shed] could penetrate [travel] for a long distance and [could carry] a high concentration layer of exhaled pollutants … due to the thermal stratification lock-up" phenomena, which certainly added the risk of short-range airborne infection transmission.

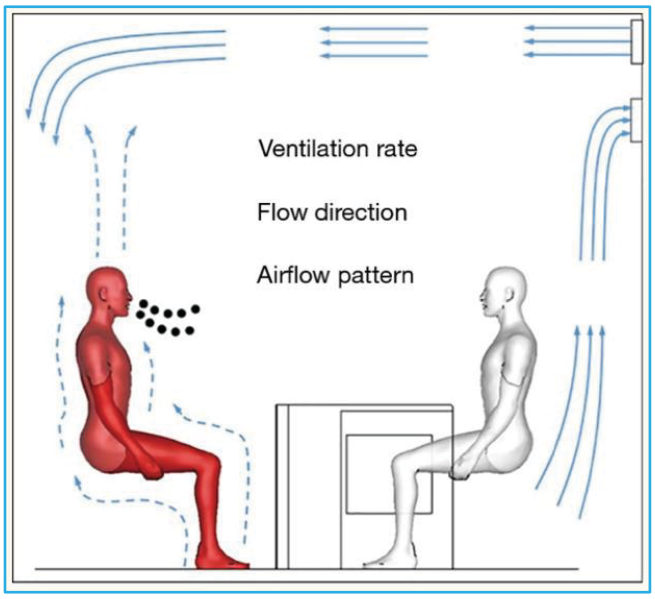
And if the height of the lock-up layer was located in the breathing zone, the risk of long-range airborne transmission would also be high. …The length of [the] exhaled jet [breath, cough, sneeze, shed] and height of lock-up layer can be predicted, which is associated with a temperature gradient, exhaled momentum and exhaled temperature difference with ambient air.

Large temperature gradient (usually in displacement ventilation) and great momentum of [the] exhaled jet enlarge the spreading distance of short-range airborne transmitted diseases, which brings a higher risk in short-range airborne transmission than in long-range airborne transmission. Results indicated that displacement ventilation might not be used in hospital wards for preventing airborne risk.

x. Preventing Airborne Transmission with Air Guardian

While no one system will make for a “safe” space, Air Guardian® adds effective pathogen removal to any area, any room, in any environment - to help remove and eliminate harmful airborne microbes before they can be transmitted within a space.
Regardless of the quality, purity, or disinfection level of air vented into a space from the HVAC system - or in spaces with little or no ventilation - Air Guardian® produces purified, disinfected air (between 2 Log and 6 Log reductions) in a protective displacement fashion (at pressure), and rapidly replaces all room air.

Air Guardian® provides the highest level of occupant safety, infection protection, and air quality within a given space.

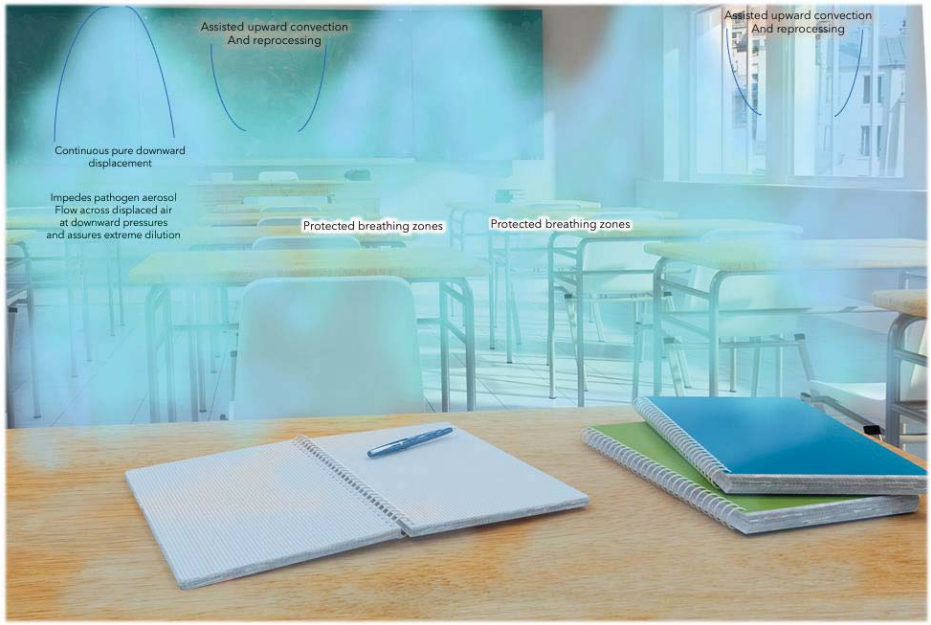


Optimal Room Ventilation Methods while reducing cross-contamination airflow

Qian and Li[12] developed an improved downward ventilation system to show a better performance to remove fine droplet nuclei. They compared the ventilation performances when exhausts were at different levels using full-scale experiments and CFD simulations. Results suggested that upper-level exhausts were more efficient than floor-level and near-head exhausts in removing gaseous contaminants due to upward body plumes.

[12] doi:10.21037/jtd.2018.01.24

The low-temperature air was supplied vertically from the top and accelerated by gravity to deliver fresh air to HCWs directly, while the exhaust grill was also arranged at the top of the ward to remove the up-flowing exhaled fine droplet nuclei. The mechanism of removing large particles is due to deposition instead of ventilation. The significance of surface cleaning is then approved. The Air Guardian® Solution is designed to do just that. Shown here is an example of the airflow depicted in a classroom setting:



xi. Air and Particle Residency within Air Guardian®

xii. Air Transport Properties: Drag, Slip, and Brownian movement in a gaseous model

The implications of Brownian movement of small air particles are important to the understanding of the Air Guardian® design and the mechanism in which tiny particles remain resident in the fixture chambers longer than the speed of the air volumes passing through the chamber. In the simplest explanation, tiny air particles have a different drag coefficient than larger particles and remain in the Air Guardian® chambers much as they do in rooms and spaces, where they can linger in large quantities, as shown in the following experiment (click picture to link):

The description and mathematics of this effect are described here:[13]

"The size of an aerosol particle is the fundamental characteristic that determines its transport properties. For spherical particles, the size is given by particle diameter (d_p). In the case of irregularly shaped particles, an equivalent diameter is used, defined by the diameter of a sphere of equal volume. Respirable particles range from a few nanometers to, typically, a few microns. The transport behavior of an aerosol particle depends on its interaction with the surrounding gas molecules. This interaction can be characterized by considering the particle size (d_p) relative to the mean free path of the gas molecules (ℓ); the ratio between d_p and ℓ is the Knudsen number

[13] Tsuda A, Henry FS, Butler JP. Particle transport and deposition: basic physics of particle kinetics. *Compr Physiol*. 2013;3(4):1437-1471. doi:10.1002/cphy.c100085

($Kn = \ell/d_p$). When Kn » 1 (i.e., ℓ » d_p), the behavior of the particle and surrounding gas requires the kinetic theory of gases.

On the other hand, when Kn « 1, (i.e., ℓ « d_p), the probability that surrounding gas molecules strike the particle surface is high, and the surrounding gas affects the behavior of the particles through a drag force.

In this case, the gas surrounding the particle can be treated as a fluid continuum, and the drag force acting on the particle surface can be calculated from Stokes' law

[$F_D = 3\pi\mu d_p (\vec{v}_p - \vec{v}_f)$

Where F_D is the drag force, μ is the fluid viscosity, and $\vec{v}_p$ & $\vec{v}_f$ are the velocity of the particle & the surrounding fluid, respectively].

For air at sea level, ℓ is approximately 70 nm, and hence for fine/ultrafine particles, Kn cannot be taken as one of these two extremes. In this case, the behavior of the surrounding gas can be still treated as a continuum, but a slip correction factor needs to be introduced to adjust the drag force given by the limiting Stokes' relationship (i.e., the corrected drag force is equal to F_D/C_s). The Cunningham slip correction factor[61] $C_s$is given by:

$C_s = 1 + (2\ell/d_p)[A_1 + A_2\exp(-A_3 d_p/\ell)]$

Where $A_1 = 1.257$, $A_2 = 0.400$, and $A_3 = 0.55$ are empirically determined constants. C_s and related particle transport properties are tabulated in Table 1. The Einstein-Stokes equation for the diffusion coefficient of a sphere also has to be adjusted to account for slip;
i.e., $D = k_B T_{abs} C_s/(3\pi\mu d_p)$, where k_B is Boltzmann's constant and T_{abs} is the absolute temperature.

xiii. Airflow resistance and Turbulent Deposition

Again, regarding particle kinetics, from:

Tsuda A, Henry FS, Butler JP. Particle transport and deposition: basic physics of particle kinetics. Compr Physiol. 2013;3(4):1437-1471. doi:10.1002/cphy.c100085

"Much research has been carried out on the nature of turbulence and into the mathematical description and numerical simulation of turbulent flows. Despite this body of work, turbulence remains relatively poorly understood.

Nonetheless, the practical effects of turbulence, such as increased flow resistance and enhanced heat transfer rates, are routinely encountered in our daily lives. The characteristic of turbulence of most interest here is the increased levels of mixing and transport, particularly in the cross-stream direction, exhibited by turbulent flows.

The increased level of flow resistance mentioned above is due to an enhanced level of cross-stream transport of momentum caused by the turbulent velocity fluctuations. *Providing certain general conditions are met, there is a direct correlation between momentum transfer and mass transfer by the turbulence.*

Hence, compared to laminar flows, turbulent flows can be expected to have increased levels of particle deposition."

In the 1990s, a series of studies on particle deposition in turbulent duct flow was done by a group led by Ahmadi[e.g.,48,205,289]. While flow in the upper airways may not be well modeled by steady flow in a duct, the results of these studies have general relevance to particle deposition in upper airways of the lung. For instance, Chen & Ahmadi (1997) considered deposition of particles in the range 0.01-100 μm and found that deposition was a complex function of particle size. Results were given in terms of a non-dimensional particle relaxation time $\tau^+ = (\rho_p/\rho_f)d_p^2(\rho_f u*/\mu)^2 C_s/18$, where ρ_f is the fluid density and $u*$ is the friction velocity (a measure of the strength of the turbulence). For small values of τ^+; that is, submicron particles, deposition increased with decreasing τ^+. Conversely, for large values of τ^+; that is, particles with diameters measured in the tens of microns, deposition increased with increasing τ^+. This implies that there is a middle range of particles ($0.05<\tau^+<0.1$) for which deposition was at a minimum. Similar results had been previously found by others[e.g.,246,328]. It is of interest to note that the shape of the deposition curve found by Chen & Ahmadi (1997) is reminiscent of the curve for total particle deposition in the lung given by Heyder et al. (1986).

xiv. Photo catalyzed oxidation, ROS, and Advanced Oxidative Properties

Since intense photo catalyzed TiO^2 oxidation is one of two forms of continuous microbiological, chemical, and particulate destruction (the other being direct UVA and UVC irradiation), it is important to describe the process and the efficacy of photocatalyzed oxidation.

From a 2015 study[14] on the viability of photocatalysis for air purification:

"The components of indoor air that affect the human condition are myriad and both particulate and gaseous. Within the set of all particles, ultra-fine particles have been directly linked to heart health. Bioaerosols can be allergens, asthmatic triggers, or mold spores [and some particles are benign. Within the set of gaseous products, some are carcinogens; some cause respiratory distress; some are toxic; some are odiferous, and some are benign. If we wish to treat indoor air to make it "healthy," one technology alone will not suffice to treat the wide range of particulates that may be encountered, as well as the wide range of gaseous components.[15]"

The Titanium Dioxide Nanoparticle

The use of Titanium Dioxide to facilitate photocatalytic ROS generation, and thus oxidation, has been known - and used - for decades. In a 2003 study, TiO2 was described as an emerging technique to add to traditional UVC light and filtration to treat air for reducing particulate materials, chemicals, and pathogens.

From Hay, SO, et al.: "Recently, there have been increasing numbers of people suffering from allergies, asthma, and bronchitis in Taiwan. Bioaerosols play an important role in these observed symptoms. Regarding the reduction in bioaerosol concentration, the commonly used methods include filtration, ultraviolet germicidal irradiation, and electrostatic precipitation. Currently, there is a new trend for pollutant control by photocatalytic oxidation (PCO) using TiO2. This process is referred to as heterogeneous photocatalysis or, more specifically, photocatalytic oxidation.

The advantages of PCO are generally recognized as safe, less expensive with low power consumption, no consumption of oxidizing chemicals, and potentially long service life.

Regarding PCO, TiO2 is a semiconductor photocatalyst with a bandgap energy of 3.2 eV. When this material is irradiated with photons of <385 nm, the bandgap energy is exceeded, and an electron is promoted from the valence band to the conduction band. The resultant electron-hole pair has a lifetime in the space-charge region that enables its participation in chemical reactions.

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[14] Hay SO, Obee T, Luo Z, et al. The viability of photocatalysis for air purification. *Molecules*. 2015;20(1):1319-1356. Published 2015 Jan 14. doi:10.3390/molecules20011319

[15] Hay SO, Obee T, Luo Z, et al. The viability of photocatalysis for air purification. *Molecules*. 2015;20(1):1319-1356. Published 2015 Jan 14. doi:10.3390/molecules20011319

Hydroxyl radicals and superoxide ions are highly reactive species that could oxidize air pollutants adsorbed on the catalyst surface (Jacoby et al. 1996).

Particularly, the pollutants, volatile organic compounds (VOCs), are preferentially adsorbed on the surface and oxidized to carbon dioxide. Therefore, rather than simply changing the phase and concentrating the contaminant, the absolute toxicity of the treated airstream is reduced, allowing the photocatalytic reactor to operate as a self-cleaning filter relative to organic material on the catalyst surface."[16]

These early observations about adding the photo-catalyzed oxidation process to existing methods of air disinfection were important in that the oxidation process could be leveraged in a multi-system environment designed to destroying particulate matter, pathogens and reducing aerosolized chemicals to safe compounds - without the need for traditional filtration and by using three separate systems for particle, pathogen and chemical destruction.

xv. Indoor Air Quality and Oxidation

Improving Indoor Air Quality includes more than just the destruction of infectious viral, bacterial, and vegetative pathogens. For example, from this same study[17], one finds:

"In normal indoor air, there are ca. 200 individual gaseous components, most in the 10-ppb range or lower, and most are volatile organic compounds (VOCs). The average tolerance index of the air found in office buildings by the BASE study is 0.884. In problem indoor air, the air that has generated complaints and or illness, there may be a considerably higher total or higher concentrations of individual components, resulting in a significantly higher tolerance index.

The type of TiO2 nanoparticle used in Air Guardian® is the rutile crystal, which is known to be favored for its abilities to oxidize various volatile compounds and gases, include the gas CO2, to the extent that CO2 levels can be oxidized into safe, non-alcohol, non-volatile non-hydrocarbon states.

If our goal is to change air quality, we can simply rate the effect of an air purifier based on its efficiency. However, in treating indoor air, our goal is to create cleaner or healthier air. This goal is somewhat nebulous as different effects can be exhibited by different VOCs. Some VOCs such as formaldehyde and benzene are carcinogens, some are toxic, some are odorous, and some are benign."

Oxidation Treatment Applications

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[16] Chia-Yu Lin & Chih-Shan Li (2003) Effectiveness of Titanium Dioxide Photocatalyst Filters for Controlling Bioaerosols, Aerosol Science and Technology, 37:2, 162-170, DOI: 10.1080/02786820300951

[17] Hay SO, Obee T, Luo Z, et al. The viability of photocatalysis for air purification. *Molecules*. 2015;20(1):1319-1356. Published 2015 Jan 14. doi:10.3390/molecules20011319

Within the past two decades, the use of advanced oxidation processes (AOPs) has been extensively studied. In nearly every medium imaginable, there have been applications that have proven effective.

The studies have led to use-case applications in many areas, including water and effluent treatment, PCO and PECO air filtration, food storage, and protection. It has also been used in medical applications, including treatments that utilize photosensitizers absorbed by human tissue.

ROS is an essential part of cancer treatment[18] and is sometimes referred to as "oxidative medicine."

"Chemotherapy and radiation therapy both rely on Reactive Oxygen Species (ROS) to work, augmenting ROS stress. ROS are essentially toxic substances like hydrogen peroxide and others that can cause damage to cells in high concentrations. ROS are natural byproducts of the metabolism of oxygen; however, more resistant cancers produce their antioxidants to fight these toxic substances.

Earlier stage cancers do not appear to have the same defense mechanisms that are found in more resistant later-stage cancers. This explains why chemotherapy and radiation therapy may not work in late-stage cancers. The answer may involve increasing ROS levels so therapy can kill cancer cells once again – this is the therapeutic aim of oxidative medicine, giving high doses of antioxidants and creating ROS instead of destroying it. Therefore, the dosing and delivery change the entire mechanism of action of integrative treatments.

Advanced Oxidative Processes are now generally regarding as "the most encouraging method for the removal of pollutants, including organic, inorganic, and microbial contaminants, compared with traditional purification procedures[19].

Airflow distance, time in-situ (time-dose), and turbulence under continuous oxidation

Within the Air Guardian® chamber (and along all pathway corridors, surfaces are coated with titanium dioxide particles[20]. The corridor pathways are illuminated with UVA 365-nm LED light, which creates constant oxidation as well as energetic UVC destruction along the linear length and surface of the corridors within the chamber.

[18] https://www.envita.com/cancer/the-important-role-oxygen-plays-in-cancer-treatment

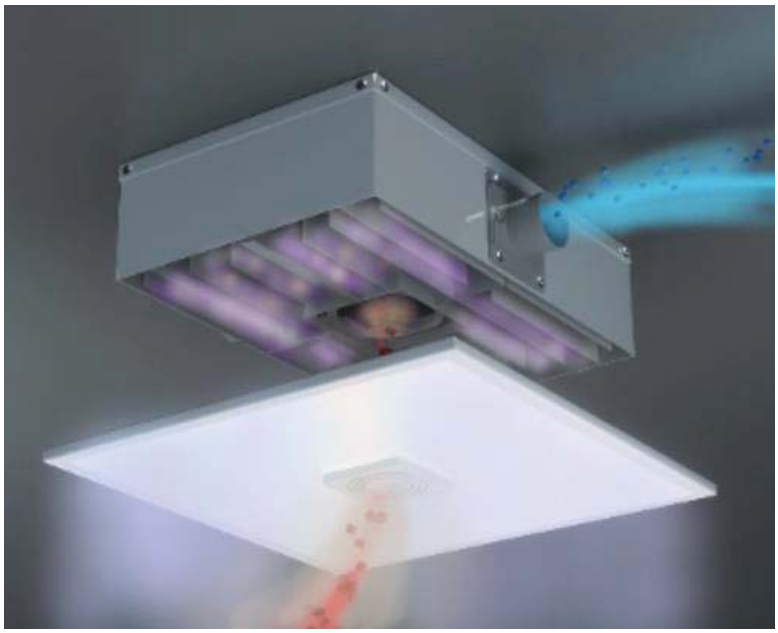
[19] Review on heterogeneous photocatalytic disinfection of waterborne, airborne, and foodborne viruses: Can we win against pathogenic viruses? DOI link: https://doi.org/10.1016/J.JCIS.2020.07.047

[20] Rutile crystals, applied in a highly affixed powder-coated process and proven in multiple laboratory tests to be resiatnt to off-gassing

The pathway corridor design of the Air Guardian® chamber (see fig. 3), contributes to air turbulence and agitation. The total length of all corridor pathways is 20 linear feet.

The airflow distance and turbulence both contribute to the efficacy of a more complete oxidation process[21]:

The photocatalysis of gaseous species can be viewed as a multi-step process where adsorption of gaseous species onto the catalyst surface occurs first. All the interesting chemistry in this process



occurs at the gas-solid interface between the photocatalyst, for example, solid titanium dioxide (TiO_2), and a contaminated airstream.

One way that the adsorption of molecules on a surface can be expressed … is to relate the surface concentration …to the collision frequency of the molecules with the surface, … and the retention time, …of the molecules with the surface.

Thus, turbulent airflow travels 60.312 inches within each section of the chamber, for a total of approximately 20 linear feet. **This is the "retention time with the surface" and it greatly enhances the efficacy of the destructive oxidation process within the sealed chamber.**

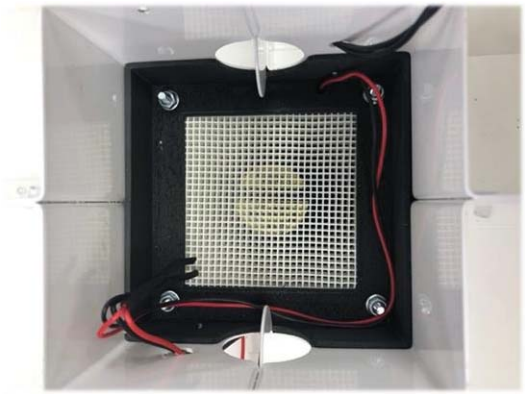
The Air Guardian® design **thus facilitates both surface contact and collision frequency using turbulence to facilitate the collision of gaseous, particulate, and pathogenic contaminants.**

[21] Hay SO, Obee T, Luo Z, et al. The viability of photocatalysis for air purification. *Molecules*. 2015;20(1):1319-1356. Published 2015 Jan 14. doi:10.3390/molecules20011319

An Immediate Oxidative Cloud with UVA irradiance

Within Air Guardian, air first passes through a ceramic mesh of titanium dioxide (see figure 2), embedded with TiO2 nanoparticles, which are rutile-state reflective crystals. They are highly reactive to ultraviolet light. The ceramic mesh used is irradiated by powerful UVA 365 light, thereby forming a cloud of highly reactive electrons and subsequent ROS. The UVA light irradiance itself is also destructive, so dual toxicity begins immediately within Air Guardian.

Air Guardian® Advanced Oxidizing Process:



- UVA 365nm light catalyzes nanoparticles (within Air Guardian® Titanium dioxide is used)
- Extreme levels of ROS are created as air enters the immaculite, as UVA 365 is directed against a concentrated nanoparticle matrix of titanium dioxide
- Energy directed against Titanium dioxide causes outer valence electrons to shed as highly reactive oxygen species (ROS) like -OH, -O, and H2O2, which are produced in abundance within the enclosed chamber
- The ROS wash over the incoming air from the Air Guardian® intake
- The ROS species aggressively oxidize organic contaminants to CO2 and inorganic ions
- The ROS reduce (disassemble) inorganic contaminants and volatile chemicals to nontoxic ions throughout the pathway corridors - using UVC-photocatalysis of coated nanoparticle surfaces
- The ROS inactivate microorganisms, including viral pathogens
- The ROS oxidation process produces no noxious compounds

After air passes through the TiO2 mesh and is irradiated with UVA energy, it enters a pathway of corridors that are coated with Titanium nanoparticles. These TiO2-lined corridors represent 20 linear feet of “photocatalytic reactors,” which are energized by powerful UVC irradiation at 265 nm. This means that the pathway corridors are also illuminated with UVC irradiant energy.

xvi. Continuous UVC Irradiation

While many air filtration devices that use UVC measure the irradiance energy in mJ/cm^2, the total energy of the UVC irradiance in Air Guardian® can be in mJ/cm^2 or Joules/cm^2.

The destructive energy of the UVC irradiance alone (without concurrent oxidation) has been shown, in independent laboratory studies, to kill most pathogens and destroy most molecular structures within seconds (see figure 3). The irradiance levels used in these studies varies, but it is usually between 6 Joules/cm^2 and 30 Joules/cm^2.

The 2x4 Air Guardian® has a safe irradiance measured as:

2x2 TOTAL	2x4 TOTAL	2x2 TOTAL	2x4 TOTAL
in Joules		in mJoules	
30.81	170.41	30,807.00	170,414.00
TOTAL DOSE IN SINGLE PASS THROUGH BOX			

The Air Guardian® fixture is functionally categorized as a “UVGI” device. In its UVGI form, it can be additionally described as a “sealed, upper-room UVGI device.”

Sealed UVGI systems are often recognized as effective in removing airborne pathogens, but room air must pass over the UV-C lamp enough times to inactivate or destroy not just SARS-CoV-2 - which UV-C readily inactivates at relatively low dose-time levels - but also other pathogens, such as mold, fungus, gram-positive, spore forms, and other difficult to kill microbes.

The highest level of UV-C energy found in any competing sealed, upper-room UVGI device is 80,000 millijoules, with most systems ranging between 12,000 - 30,000 millijoules. With few exceptions, most UVGI fixtures use UV-C lamps (not LEDs), over which ingested air is passed within seconds or sub-seconds before being vented from the same fixture into the room.

Only a few sealed devices have active air induction (versus passive induction via convection processes) and the typical fan speed for a sealed UVGI fixture is 50 cubic feet per minute. This is important because it reflects how capable the system is to move room air through the fixture and provide “air changes per hour”, or ACH.

Note the following regarding time/dose. In modeling or calculating efficacy of the disinfection process, it is important to calculate the energetic irradiance of the UVC lamp in millijoules as well as the time in durations (seconds) that the pathogen is exposed to the dose.

Remarkably, most sealed UVGI fixtures push air, without any impedance, across UV-C lamps at between 50-100 cubic feet per minute. At 50 cubic feet per minute, given the engineering calculations[22], air passes across the UV-C lamp(s) at a speed of 114.4 inches per second. At this speed, air is exposed, in full, for 0.2 seconds. This does not support effective time/dose models of disinfection efficacy in a single-pass across the UV-C lamp.

Importantly, Air Guardian® actively ingests air and "holds" air inside the device for several seconds. In doing so, the Air Guardian® design ensures that microbes and particles are exposed to an extreme UV-C dose for a much longer period of time. This mean that higher Log reductions can be achieved within a "single pass" through the system.

As a sealed fixture, Air Guardian® can safely irradiate at these extreme UV-C energy levels because it does not expose humans to UV light. All UV light is sealed within the Air Guardian™ fixture. Kill-switch safeguards are built into the Air Guardian® device should the sealed fixture be breached in any way.

[22] https://www.engineering.com/calculators/airflow.htm

xvii. Regarding the UV disinfection mechanism

As previously stated, this UVC irradiation provides the following utility, as described in, "The Study of an Ultraviolet Radiation Technique for Removal of the Indoor Air Volatile Organic Compounds and Bioaerosol":[23]

[UVC irradiation] is generally applicable in three areas, as follows: Inside the ducts used for mechanical ventilation, return air units, and any indoor area. The DNA of contagious airborne pathogens is damaged by the energy of UVGI (UVC) light, which interferes with its duplication, rendering the organisms noncontagious.

From "The Study of an Ultraviolet Radiation Technique for Removal of the Indoor Air Volatile Organic Compounds and Bioaerosols":

- The mechanism by which UV light removes air pollutants is photochemical dissociation.
- This process involves the absorption of photons by molecules, resulting in the excitation of their electrons enabling them to jump from low- to high-energy states.
- Excited electrons can break the chemical bonds, thereby altering the physical and chemical properties of the molecule.
- The elimination of air pollutants by UVC at wavelengths less than 290-nm involves direct photolysis, in which molecules that absorb light energy enter a chemically active state that breaks their chemical bonds,
- In Shie et al., it was indicated that UV light of shorter wavelengths is more efficient for the removal of formaldehyde (HCHO). Air Guardian® uses 265-nm UVC wavelength
- The efficacy of photolysis is dependent upon the energy, distance, temperature, and relative humidity

[23] http://dx.doi.org/10.3390/ijerph16142557

xiii. Filtration and precision venting

As a final step, Air Guardian® uses both charcoal and micron filtration, which is used as a safety step to eliminate any unwanted molecular or volatile organic byproducts, should they remain after passing through the active pathway corridors.

After the air is processed, it is vented from the Air Guardian® fixture by two separate exits, which are then exhausted through at least six feet from the fixture such that air can be dispersed into the lower third of the room.

Air displacement is equal to 950 kg of air per second from each vent, pushed downward into the breathing zone, providing what the CDC termed “personal protective airflow.”

This process provides for the constant distribution of clean, disinfected, and filtered air at average human height without creating aggressive biofilm aerosolization on floors or surfaces.

Generic fixtures that intake and exhaust within the same fixture cannot ensure reliable room air changes. Some UVGI systems recommend ceiling fans to circulate room air, which exposes the possibility of biofilm aerosolization. Air Guardian® vents in such a way that room air changes are more efficient, and aerosolization is less likely. (see above section on Airflow Dynamics)

xix. Indoor Air Quality (IAQ) and disease

The air itself carries particles, pollutants, pathogens, and chemicals, all mixed within ambient chemicals we know as “air” - that is, H_2O CO_2, O_2, N, etc.

Indoor air quality is one of the major health challenges facing the world’s population today. It is estimated that over 4 million people die each year from fine particle (PM 2.5) inhalation. The mortality is caused by cardiovascular disease, respiratory failure, pneumonia, and cancer.

Further, it is well-known that in environments where pollution (particulates) and contaminants are high, infectious disease is also found to be in greater incidence.

Recent studies[24] also link PM 2.5 particles to a greater incidence of Alzheimer’s disease when children are exposed at a younger age.

Airborne chemical carcinogens, such as benzene, toluene, acetaldehyde, formaldehyde, and other compounds are known to be highly associated with many cancers, including lung cancer, lymphoma, and leukemia.

For example, ambient airborne Benzene has been definitively associated with cancer and can be emitted from certain household products made of plastics, resins, nylon, and synthetic fibers. Benzene is also used to make some types of lubricants, rubbers, dyes, detergents, drugs, and pesticides.[25]

Air Guardian’s air purification process, consisting of oxidation and UVC irradiation, removes ambient airborne benzene.

The importance of this purification process can be emphasized by a review of this study:

Residential ambient benzene exposure in the United States and subsequent risk of hematologic malignancies[26]

The study focuses on ambient airborne benzene and its association with cancer:

“The focus of this study is on evaluating potential cancer risks of ambient benzene exposure in the general population. This is important because the majority of previous studies investigating

[24] Li RL, Ho YC, Luo CW, Lee SS, Kuan YH. Influence of $PM_{2.5}$ Exposure Level on the Association between Alzheimer's Disease and Allergic Rhinitis: A National Population-Based Cohort Study. Int J Environ Res Public Health. 2019 Sep 11;16(18):3357. doi: 10.3390/ijerph16183357. PMID: 31514400; PMCID: PMC6765937.
[25] https://emergency.cdc.gov/agent/benzene/basics/facts.asp
[26] Lauren R. Teras W. Ryan Diver Emily L. Deubler Daniel Krewski 09 February 2019 https://doi.org/10.1002/ijc.32202

associations between benzene exposure and the risk of particular malignancies included only individuals exposed to benzene in an occupational setting.

Of the 115,996 participants included in this analysis of the ACS-CPSII cohort, 2595 cases of hematologic cancer (1427 men and 1168 women) were reported between 1997 and June 2013, the date follow-up concluded.

In the overall cohort, ambient benzene exposure was positively associated with myelodysplastic syndrome …and T-cell lymphoma…. In the cohort of men only, ambient benzene exposure, a positive association was also observed for ambient benzene exposure and any hematologic malignancy."

In conclusion, the authors wrote that "the results of this study suggest that ambient benzene increases the risk of MDS and lymphoid malignancies, particularly follicular lymphoma, and T-cell lymphoma. Future studies with large numbers of cases of each subtype are needed to confirm these associations." [27]

To illustrate the potential harm of ambient benzene, a September 2020 article notes that the EPA is being sued by environmental and climate groups for not regulating the release of Benzene from Steel Mills in Northwest Indiana, near Chicago[28]:

"The Environmental Protection Agency is facing a lawsuit for not setting limits for certain hazardous air pollutants at steel mills — like mercury and the cancer-causing chemical benzene.

About 90 percent of the steel mill emissions in the U.S. come from three facilities in northwest Indiana.
The LaPorte County branch of the NAACP, the Hoosier Environmental Council, the Clean Air Council, and the Sierra Club are all petitioners in the suit…

People who live in areas with a lot of air pollution are also more likely to have the underlying heart and lung conditions that put them at greater risk from COVID-19.

Earthjustice attorney Jim Pew represents the groups in the lawsuit. He said technology to remove these pollutants at steel mills — like mercury and the cancer-causing chemical benzene — has been around for decades.

xx. Indoor Air Quality and Air Guardian

[27] Teras LR, Diver WR, Deubler EL, et al. Residential ambient benzene exposure in the United States and subsequent risk of hematologic malignancies [published online February 9, 2019]. *Int J Cancer*. doi: 10.1002/ijc.32202
[28] https://www.wfyi.org/news/articles/indiana-groups-sue-epa-for-not-regulating-certain-steel-mill-pollutants

Air Guardian® provides the highest quality room air changes per hour

- 99% - 99.999% purification in a single pass
- Three levels of filtration
- Removes pollutants, particulates, and pathogens
- Removes all volatile chemical compounds

Air Guardian® returns ultra-purified air into the breathing zone

- Displaces air into safe breathing zones using slight downward pressure

Air Guardian® Provides an Unmatched Level of Indoor Air Quality

- Single-Pass Efficiency
- Captured air processed for 36 seconds
- Intense nanoparticle filtration and oxidation
- Micron and charcoal filtration
- High-energy UV-C irradiance and oxidation for 19 linear feet
- Unique air processing destroys particulates, pollutants, and pathogens

xxi. The Air Guardian's unique, multi-patented processes

1. Filtration and purification are active, not passive. This active ingestion and downward airflow displacement process conforms to optimal airflow and venting recommendations that help prevent disease transmission and facilitate more complete room air changes
2. UV-A photo-catalyzed nanoparticle oxidation in a patented fore-chamber - Ingested air is initially passed through a localized, intense ROS (reactive oxygen species) cloud in a specialized chamber. The ROS cloud and extreme UV-A irradiance combine for high initial levels of destruction/inactivation
3. Intense time-dose UV-C irradiance - ingested air is forced through a series of precision-designed channels, designed with patent-pending measures and angles and distance to maximize optimal radiant distance, dose strength, irradiant light reflectivity, and continuously exposed to time-dose UV irradiance for as long as 12-25 seconds, depending on device models and options
4. UV-C photo catalyzed nanoparticle oxidation - Air Guardian's internal channels are flooded with electromagnetic UV-C radiation wavelengths, which a) inactivate and destroy pathogens and particles and b) trigger photo-activation of the channel surfaces, which creates continuous clouds of reactive ion species, which form within every channel and along every surface inside the Air Guardian® device
5. Air Guardian's UV-C dose energy is > 200% of the required levels for the inactivation/removal of most pathogens, with few exceptions (proven in numerous studies).
6. Air Guardian's extreme UV-C dose is highly effective at removing pathogens and particles, yet safe in any setting because no UV energy is emitted from the sealed device
7. Air is filtered using HEPA-like super-micron and carbon filters and released at precise pressures and distances to create constant downward displacement into breathing zones
8. Complete room air changes can be performed as frequently as every few minutes, depending on device selection

For additional information on Air Guardian® science and research sources:
https://www.motivelighting.net

xxii. CleanWhite Antimicrobial Visible Light Solution

A detailed description of antimicrobial blue light technology
The utility, function, mechanism of action of antimicrobial blue light
Technology, and use Case examples

xxiii. Validation of visible blue light efficacy

Extensive independent and laboratory testing has been conducted for more than a decade on the effects of 405 and 470 nm wavelengths on microbial disinfection. Research and literature on the subject have been exhaustive and have included studies on microbial species, dose, periodicity, and wavelength requirements to inactivate or reduce bacteria, mold, fungus, and yeast.

The results of these numerous studies have enabled and promoted the use of 405nm and 470nm disinfecting light into mainstream healthcare and commercial use in both in vitro and in vivo disinfection.

An extensive listing of the literature is referenced within and at the end of this document.

Note that many studies derived results using lower doses of 405 nm and 470 nm energies, guided by standard scientific laboratory process. The doses used, often in mJ/cm^2, were often significantly lower than those used by the current dose emitted by the motiveLighting® CleanWhite™ chipset, which is usually controlled to 44-60 Watts, or an equivalent of 44-60 J/cm^2. However, it can be precisely controlled to higher doses up to 120 J/cm^2.

motiveLighting® used an independent lab to test generation 1 chipsets on specific species that represented known resistant pathogens, including:

- Aspergillus brasiliensis BCRC 30506; ATCC 16404
- Staphylococcus aureus subsp. Aureus (drug-resistant) BCRC 15211; ATCC 33591
- Salmonella enterica subsp. Enteric (drug-resistant) BCRC 12947; ATCC 13311

The motiveLighting® chipset used in the study was dosed at .6 J/cm. This independent, certified test validated the results expected with motiveLighting® generation 1 chipset, based on the decades of study and testing mentioned above.

Over 97% colony reduction rates were observed for both Staphylococcus aureus subsp. Aureus (drug-resistant) and Salmonella enterica subsp. Enteric (drug-resistant) over 24 hours.

The testing also validated the expected result for Aspergillus brasiliensis, a spore-forming species known to be very resistant - except at higher 405-470 energy doses.

When the results are extrapolated to higher-energy motiveLighting ® 4 generation energy doses of 50-120 J/cm^2 (between 83 and 200 times the dose used in the generation 1 chipset test), Aspergillus brasiliensis is shown to be highly susceptible to 405/470. However, the exact time to reach 2 Log reduction depends on colony size and dose.

Of further note, each species was tested in conditions of unusually high CFU counts, up to 9.0 x 10^4 (90,000 CFU's per square centimeter).

Thus, the existing literature and specific testing of the motiveLighting® chipset confirm the utility and performance of the technology, even at low doses. Today's motiveLighting® 4 generation chipsets are between 83 and 200 times more energy-dose efficient than those used in initial tests.

xxiv. 405 / 470 Technology and Mechanism

motiveLighting' s CleanWhite™technology is available as a separate luminaire or as an integrated component of the Air Guardian fixture.

The Immaculite fixture includes a patented form of visible light disinfection and illumination, called CleanWhite™.

In its utility, it emits sharp spikes of 405-nm and 470-nm wavelengths, which represent two specific, safe wavelengths known to energize an oxidative process, which is described in a study by Ramakrishnan et al. in 2016[29]:

"The mechanism of the bactericidal action, and the occurrence of mammalian cell toxicity beyond a threshold exposure level (Ramakrishnan et al., 2014), has not been fully elucidated, but it is thought to involve the photo-excitation of endogenous porphyrin molecules, a process which generates reactive oxygen species (ROS). ROS, including singlet oxygen (1O2), superoxide anion (O2•−), hydrogen peroxide (H2O2) and hydroxyl groups (•OH), are chemically reactive free radicals that play a crucial role in cell signaling and homeostasis, but overproduction becomes toxic to cells and alters redox balance causing significant damage to cell structures via oxidation of cellular macromolecules such as proteins, lipids, nucleic acids, NADH/NADPH and soluble thiols (Devasagayam et al., 2004). Since mammalian and bacterial cells contain intracellular porphyrins, during violet-blue light exposure, these porphyrins may become photosensitized, leading to an overproduction of ROS (Kotelevets et al., 1988; Lavi et al., 2004; Lubart et al., 2011).

As with traditional photodynamic inactivation reactions, which involve the use of exogenous photosensitive dyes or porphyrins (Gayl, 2001), photosensitization using violet-blue light is thought to cause cellular damage via two different pathways: Type I and Type II. With the Type I

[29] Cytotoxic responses to 405nm light exposure in mammalian and bacterial cells: Involvement of reactive oxygen species
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mechanism, the electronically excited sensitizer (e.g., endogenous porphyrin) reacts directly with the cellular component resulting in free radical formation (e.g., O2•− and •OH). These free radicals propagate further free radical chain reactions. In the Type II process, the excited photosensitizer reacts directly with molecular oxygen resulting in the formation of 1O2 (Pattison and Davies, 2006). Both pathways culminate in significant oxidative damage to exposed cells."

This mechanism is facilitated by Air Guardian's integrated (Clean-White™) patented, single circuit light-emitting diodes (LEDs) that spike, as described in precision 405-nm and 470-nm wavelengths.

The wavelength energy has been tested to caused significant damage to bacterial and vegetative pathogens, as well as some known viral strains[30], such as norovirus, although few viral strains have been found susceptible to 405/470 damage, except when suspended within a bacterial biofilm or organic matter, upon which their damage is thought to be attributable to ROS-driven oxidative actions occurring within bacteria in biofilm or organic matter.

xxv. Fungal Light Sensitivity

Biologists have been aware since at least 1887 of visible blue light's capacity to stimulate phototropism—ability plants possess to orientate themselves toward a light source (Sachs 1887). Visible blue light, it has also been noted, performs as a cue for fungi to perform important developmental tasks, such as metabolism, growth, pigment development, spore production, and tropism (Siegel et al. 1968; CasasFlores et al. 2006; Purschwitz et al. 2006). A particular type of red bread mold called Neurospora crassa has been shown to contain blue light receptors that respond significantly to changes in light intensity. Of its receptors, one type controls recognition of transitions between light and dark, while a protein it contains (VVD) aids in regulating its light controlling system.

Blue light, whose position in the spectrum exists in a range between 400 and 500nm, provides a cue for fungi to perform their asexual development and reproduction. However, when combined with photosensitive dyes, the light has a fungicidal effect. Candida is particularly susceptible to the combination of light and such dyes as phenothiazinium, dimethyl methylene blue, and toluidine blue O.

xxvi. Bacterial Light Sensitivity

[30] See R.M. Tomb et al., "New Proof-of-Concept in Viral Inactivation: Virucidal Efficacy of 405 nm Light Against Feline Calicivirus as a Model for Norovirus Decontamination," Food & Environmental Virology, Vol. 9(2), pp. 159-67 (2017).

Under controlled laboratory circumstances, bacteria have also shown sensitivity to blue light. Building on the knowledge that light at higher frequencies can destroy microbes, researchers have recently been interested in the effects of the higher frequency bands of visible light on the integrity of bacterial cells as well as on other microorganisms. The reports on these studies claim that light inhabiting the blue area of the spectrum (with wavelength ranging from 400 to 500 nanometers) retains some of the ability to harm these microbes while relinquishing the harmful effects of its higher frequency (ultraviolet) counterparts (<400nm in wavelength). Some have shown, for example, that blue light acts as a phototoxic to the P. gingivalis and F. nucleatum groups (Feursteinet et al. 2004). Similarly, light from argon lasers emitted at low fluencies and existing within a band of 488 – 514nm have a phototoxic effect on the Gram-negative anaerobic and porphyrin-producing bacteria Porphyromonas and Prevotella spp. Bacteria that thrive in the oral cavity and which, exhibiting black pigmentation, is derived from dental plaque, have been destroyed by blue light emitted at an intensity level of 4.2 J $cm^{-2,}$ and P. melanogenic, despite requiring the higher intensity of 21 J cm^{-2}, was nevertheless also destroyed by the blue light.

Also inactivated by blue light emission were Propionibacterium acnes, and this occurred without any added exposure to photosensitizing substances that would induce increased light sensitivity That is, the blue light by itself was enough to eliminate the viability of P. acnes. Salmonella aureus, too, which has no pigment, is sensitive to visible light, and the optimal wavelength for eliminating its viability has been pinpointed within a bandwidth of 10 nanometers. The lower part of the visible light spectrum—400 to 420nm—has been identified as that having the greatest bactericidal effect, with its peak effect occurring within the smaller 400 – 410 band (i.e. 405nm ± 5nm).

Many other studies have shown the effective parts of the spectrum to reside around the 405nm mark, with little effectiveness occurring at bands higher than 430nm.

However, other more recent studies have identified sanguine effects on the inactivation of bacteria and other microbes (Maclean et al. 2008). Guffey and Wilborn, for instance, show that S. aureus is inactivated using visible light of wavelength 470nm. Certain bacteria that inhabit the digestive system, such as the Helicobacter pylori, were also sensitive to visible light of a similar wavelength.

Of particular interest are those especially infective types Escherichia coli, Staphylococcus aureus (anaerobic bacillus that shown significant resistance to methicillin, an antibiotic), and Pseudomonas aeruginosa (PA). In vitro experiments have shown significant reductions in their viability as a result of blue light exposure (Guffy and Wilborn 2006). The light excites photosensitive porphyrins inside the bacteria, which causes them to exhibit the bactericidal effect upon exposure. However, it was also found that those bacteria without such light-sensitive compounds can also be killed by combining the exposure to blue light with the use of non-toxic dyes that themselves activate upon exposure to light. Examples of such dyes are the cationic phenothiazinium types. Together, the photo-activable dye and the blue light cause the production of reactive oxygen species (ROS).

xxvii. Chemical Photosensitivity

Safe chemicals have been recently found to have fungicidal properties as a result of their greater ability to absorb light from the environment. This causes an increased photosensitizing effect on the fungi exposed to them. Because these chemicals are also lipophiles and show stability concerning photodegradation, they can remain viable and withstand the deteriorative effects of the blue light, even as they increase the vulnerability of the fungi to the same light exposure. Cationic fullerenes and benzo [a] phenoxazinium chalcogen analogs (BCA) are some of these chemicals that act as adjuvants to the effects of blue light (Tegos et al. 2005).

xxviii. Reactive Oxygen Species

Reactive oxygen species (ROS) have also been induced by bacteria's exposure to light. Included in these species are oxygen radicals, peroxides, and singlet oxygen—usually tiny molecules whose high reactiveness comes from the fact that they contain shell electrons of unpaired valence. Biological cells have negative responses to high quantities of ROS, and this property has been useful in such photodynamic treatments used in cancer and antibacterial therapies (Lubart et al., 2011). Photodynamic therapy (PDT) usually uses exogenous photosensitizers added to the cells, to which the light source (set to an appropriate wavelength) is subsequently applied. The molecules used as photosensitizers give off energy to the surrounding molecules of oxygen, and this leads to ROS formation.

Visible light also can stimulate ROS in vivo once the light has been absorbed by the cell's endogenous sensitizers (e.g., porphyrins, flavins, cytochromes). These endogenous sensitizers can absorb light from a wide spectrum of its visible range, with maximum absorption occurring from the blue band. Bacteria, too, has endogenous photosensitizers, and Lubart et al. (2011) explore the possibility that blue light of high intensity could cause significant ROS in bacteria and thereby lead to their destruction. Bacteria such as Propionibacterium acnes, which do contain significant amounts of endogenous photosensitizers, readily die as a result of light exposure. Strains of the same bacteria whose difference manifested in their porphyrin content were shown to react differently under exposure to visible light (Lipovsky et al., 2009).

xxix. Light Wavelengths

Varying the wavelength of the light while it is being used in conjunction with the chemicals has also been shown to improve the effectiveness of the bactericidal and fungicidal treatments. Even polychromatic white light, when used in conjunction with the bisamino phthalocyanine BAM-SiPc (unsymmetrical), has been demonstrated to lower the viability of Candida albicans (So et al. 2010). The effectiveness is made more apparent when white light is coupled with cationic fullerenes: this combination renders Candida albicans ineffective with just 10 minutes of exposure (Tegos et al. 2005).

Methylene blue, BAM-SiPc, and BCA all act as adjuvant to the effects of red light against C. Albicans. The combination of red light with methylene blue inhibits the growth of C. Albicans as well as the formation of its germ tube, and this occurs as a result of an increased permeability granted the organism by the effects of both actants together. The food dye erythrosine (Red no. 3) is among the chemicals with photosensitizing properties that enable them to combine with light to increase fungicidal effects.

xxx. Contemporary research into 470nm blue light

De Lucca et al.'s 2012 research into the effects of blue light at a specific wavelength of 470nm uses:

1. Two LEDs with the blue light that peaks at 470nm
2. An incubation mechanism to test the effects of ambient temperatures on fungi or bacteria after exposure to LED

Two separate methods of using electromagnetic radiation via light-emitting diodes (LED) have been generally in use. Photodynamic therapy (PDT) uses the light of a particular wavelength (here 470nm) to stimulate a photosensitizer supplied by the researcher as a third ingredient. PDT shows great therapeutic promise and is used to generate reactive oxygen species (ROS), which eliminate the microorganism to which it has been applied whenever the ROS reaches toxic levels. The second approach allows the light to locate, directly within the microbe, photosensitizers intrinsic to its cells. These will react with the light without intermediation by a third compound and provides a simpler and, therefore, more transparent process of bactericide and fungicide that supports examination and research.

The research done by De Lucca et al. (2012) closes gaps in the scientific community's knowledge about the effects of filamentous fungi on monochromatic light used in conjunction with photosensitizing chemicals. It also contributes to an understanding of blue light's effects on filamentous conidia of the non-germinated and germinating types, with distinctions made between blue light's use both in and out of the presence of erythrosine. Fungi used in the study are Penicillium digitatum (PD) and Fusarium Graminearum (FG). Citrus exposed to PD evince rot and FD, which naturally occurs in environments where wheat is stored, renders grain unsafe for consumption after harvesting whenever storage conditions allow for the growth of the fungi.

Leuconostoc mesenteroides is a soil-borne bacterium that contributes to the deterioration of beet and cane sugars in U.S. agriculture, and Bacillus atrophaeus is used as a proxy for the more aggressive Bacillus anthracis. Pseudomonas aeruginosa (PA) causes serious infections to burn wounds, contaminates medical equipment, and leads in many cases to dermatitis upon contact with skin.

xxxi. Effects of 470nm blue light on bacteria

2006 in vitro study, which determined that 470nm light kills S. aureus and P. aeruginosa, was designed based on the apparent variability of the bacteria's behavior and dose (intensity) and wavelength of the light used. The S. aureus and P. aeruginosa were treated using lights that peak at 405 and 470nm. For the 470, energy levels ranging from 3 to 15 J cm^{-2} were used. The bacterial colonies were counted in preparation for comparison to control populations, which were not treated with light. The 470nm blue light rendered P. aeruginosa invalid (96.5% reduction) for every dose given. For S. aureus, however, the effective doses were limited to 10 and 15 J cm^{-2}, with the highest reduction in colony count being 62%. The indication by these results is that blue light is indeed effective in killing bacteria, but the effect is dependent on the dosage for most (Guffey & Wilborn 2006).

In De Lucca et al.'s 2012 study, AR1 (the first light array, which was of an impure blue constitution) had the effect of significantly reducing the growth of Leuconostoc mesenteroides (LM). Their colony-forming units (CFU) began exhibiting reduction at an intensity of 150 J cm^{-2}, and when intensities grew to 180 J cm^{-2}, the CFU reduction and loss of viability reached 80%. Treatment with AR2 (the second light array which resided in the pure blue range) resulted in no reduction in the levels of LM. After treatment, LM levels increased only in an incubation environment of 25°C and remained dormant at other temperatures.

AR2's lack of bactericidal effect on LM was atypical of the experiment's general results. Both AR1 and AR2 reduced the levels of CFU in Bacillus atrophaeus (BA), with AR1 reducing the colonies significantly at light intensity levels of 40 J cm^{-2} and killing all colonies and bacilli at 80 J cm^{-2} in conjunction with incubation at 25°C and 30°C. AR2 did achieve viability reduction beginning at 100 J cm^{-2} but required a much higher intensity of 300 J cm^{-2} and incubation temperatures of 37ºC and to achieve results comparable to those of AR1. AR2 achieved approximately 100% reduction and zero growth only at 300 J cm^{-2}. This is a much higher light intensity level than required by AR1 at 100 J cm^{-2}. The indication from these results is that blue light requires traces from other wavelengths to produce its more effective anti-bacillus effects.

Post-AR1 exposure to 60 J cm^{-2} of impure blue light intensity, BA cells were incubated at 25ºC, 30ºC, and 37C. Those that were incubated at the higher the highest temperature (37ºC) showed lower viability loss than those exposed to the lower temperatures of 25ºC and 30ºC. However, the differences were not statistically significant. Unlike those cells treated by AR1, AR2 cells did not exhibit a difference in viability loss between those exposed to 25ºC, 20ºC, or 37ºC temperatures.

The most sensitive of the various bacteria to blue light was the Pseudomonas aeruginosa

(PA), which responded to both AR1 and AR2 with significant reductions to viability. At just 8 J cm^{2}, PA showed the highest reduction of CFU, which amounted to 84% at incubation temperatures of 25ºC. When the energy levels were increased to 10 J $cm^{-2,}$ and PA's optimal incubation levels of 30ºC and 37ºC were used, the respective reduction rates were 58% and 54%. Interestingly, AR2

had a better effect on viability loss for PA at an intensity of 8 J cm^{-2}. The CFU reduction at these levels was 96% at a post-light treatment incubation temperature of 37ºC —which is the optimal growth level for this particular bacterium. Exposure to the lower temperatures of 25ºC and 30ºC resulted in viability reductions of 62% and 57%, respectively. The lethal effects of the blue light were increased for PA in direct relation with the increase of light intensity. Its behavior suggests that pure blue light is more effective at reducing its viability than impure blue alloyed with other wavelengths.

xxxii. Effects of 470nm blue light on fungi

Penicillium digitatum

For Penicillium digitatum's non-germinated conidia, neither blue light nor erythrosine (ERY) alone was able to reduce viability when compared with mean growth levels of the control group to which no blue light or ERY treatments were given. However, when the two were combined—blue light along with 11.4 µmol l^{-1} of ERY—the result was a significant reduction in the population, amounting to approximately 40% for blue light of 80 J cm^{-2} and 70% for 100 J cm^{-2} of blue light. These levels are recorded in comparison to the control.

Doubling the dose of ERY to 22.8 µmol l^{-1} caused population reduction to become significant at lower blue light intensities. At 40 J $cm^{-2,}$ the reduction was 25% compared to controls exposed to no light or ERY. The reduction in CFU reached the respective levels of 80% and 95% when the intensity of blue light was raised to 80 J cm^{-2} and 100 J cm^{-2}. Thus, PD exhibits significantly lower levels at lower energy levels when compared with those exposed to lower doses of ERY. It also exhibits lower levels compared with controls treated with ERY or blue light alone.

For Penicillium digitatum's germinating conidia, the study showed no significant reduction in CFU when exposed to ERY and blue light when compared with the control group, exposed neither to light nor ERY. Yet, the germinating conidia showed significantly higher susceptibility to the combination of blue light and ERY than their non-germinated counterpart. The decreases in viability were about 80% to 98% when blue light of intensity levels 40-100 J cm^{-2} was combined with 11.4 µmol l^{-1} of ERY, which represented a greater reduction than that shown by the control exposed to no ERY or light. When the ERY levels were doubled to 22.8 µmol $l^{-1,}$ and blue light levels lay at 40 and 100 J cm^{-2}, the reduction in CFU rose to 95% and 98%, respectively. When the light was combined with ERY in this way, it also caused a significant reduction in CFU as compared with the results from control groups exposed to blue light alone or ERY alone.

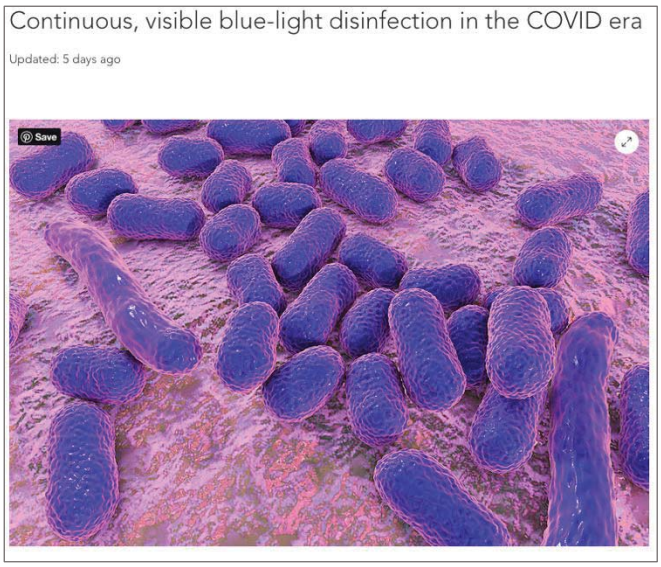
Fusarium graminearum - when FG non-germinated conidia were treated only using ERY, it showed no significant loss of viability, regardless of the dosage of ERY used—whether 11.4 or 22.8 µmol l^{-1}. The same was true for conidia exposed only to blue light ranging from 20 to 100 J cm^{-2}. However, when conidia were exposed to blue light intensities of 40, 80, and 100 J cm^{-2} in the presence of ERY at 11.4 µmol l^{-1}, their CFU showed statistically significant losses in viability

amounting respectively to 80%, 95%, and 100% of their original levels. Doubling the concentration to 22.8 µmol l^{-1} and adding blue light with 40 J cm^{-2} of energy led to a reduction in viability of 100%.

In comparison to control groups, germinating conidia responded with resistance to ERY treatment on their own at both levels of 11.4 and 22.8 µmol l^{-1}. Contrastingly, blue light alone was enough to significantly reduce the levels of CFU for germinating conidia. This occurred at energy levels 40, 80, and 100 J cm^{-2} and respectively granted 36, 42, and 47% reductions in CFU levels. The viability losses increased to approximately 90% and 100% when these conidia were exposed to blue light of respective intensities of 40 and 80 J cm^{-2} in combination with 11.4 µmol l^{-1} of ERY. The blue light of intensities 20 and 40 J cm^{-2}, when combined with ERY of twice the concentration (22.8 µmol l^{-1}), led to a larger viability reduction of 80% and 100%. (Note the much lower intensities for blue light.)

The blue band of the light spectrum, 405–470 nm, has a bactericidal effect on Pseudomonas aeruginosa (PA) and on S. aureus, which has shown resistance to methicillin (Guffy and Wilborn 2006). The results of this research by De Lucca et al. show that a similar reduction in viability occurs for LM and BA in the presence of blue light. AR2 peaked at 470nm, and the blue light it emitted was purer than that emitted by AR1, which showed traces of light lying within three ranges of the spectrum: 420–450 nm (indigo), 500–510 nm (cyan), and 520–535 nm. Thus, the study shows in general that blue light produced with no adulteration of light from outside the 405–470 nm band was less effective at reducing the viability of bacteria than that which did contain traces of other types of light, particularly indigo, cyan, and green.

For more information on CleanWhite™ technology and its important role in the Covid era, see our blog, “Continuous, visible blue-light disinfection in the COVID era.” Which can be found at https://www.motivelighting.net



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Motive Lighting

Air Guardian® Air Disinfection and Purification Device
CleanWhite® Visible Light Surface Disinfection LED technology

November 1, 2021

Motive Lighting, a Senior Brand of CalyxPure, Inc.
A Houston, Texas, United States corporation
Motive Lighting products are manufactured in the United States
All Motive Lighting quality control standards and procedures are strictly regulated

State, Federal, and International technology certifications registered to Motive Lighting
Registrations and Certifications include, but are not limited to:
CE (international), ETL (international), RoHS (international), IUVA (international)
California Air Review Board (CARB)[1]
United States FDA Facility #10077990
United States EPA Establishment# 98105-TX-1
United States FDA Medical Device Classification: Device Class II
United States FDA Medical Device Listing #D420497

Motive Lighting products supported and authenticated in this document include:
Air Guardian® Model 3F
Air Guardian® Model 6F
Air Guardian® Model 3FP (portable)
CleanWhite® antimicrobial 405+470 LED fixture forms
illumiLens™ impurity-free dose conservation lens

Support and authentication information includes sourced materials on biophysical science, wavelength and optical technology, electrochemical surface and ambient air reactions, computational fluid dynamics, biohazard lab testing, GLP lab testing, electrical safety, ultraviolet light safety, antimicrobial blue (visible) 405 nm + 470 nm light disinfection performance, safe wavelength spectra for skin and eyes, and real-world testing constructs and variables.

[1] 2x4 devices are CARB certified, 2x2 devices are pending certification

What is Motive Lighting?

Motive Lighting is a Senior Brand of products andtechnologies within CalyxPure, Inc.

The Motive Lighting product suite features air disinfection, air purification, visible light surface disinfection, and indoor air quality measurement and management systems.

Motive Lighting products incorporate the proven science and emerging innovations of multiplebiophysical technologies.

The Motive Lighting solutions include Air Guardian®,CleanWhite®, and Vertices Air Quality Management System.

The global need for the Motive Lighting productsuite

For many decades, scientists and epidemiologists have been aware of the environmental and biological contaminants that have been pervasive in spaces like schools, hospitals, transportation, hospitality, and other industries.

Yet, it wasn't until the COVID era that protecting occupants from environmental hazards was given widespread, worldwide attention. The COVID pandemic revealed and cemented the importance of public environmental safety and equality.

Everyone's health is affected by the environment in which we live our daily lives. How we travel, where we work, where we live, and where we socialize. In each of these settings - in each space - the air we breathe and how our bodies interact with the spatial environment affect our health and well-being.

Motive Lighting technologies protect people wherethey live, work, travel, and socialize. In hospitals and healthcare centers. At their dentist. Where they shop, where they eat. In any space.

Motive Lighting technologies address the many elements that affect health and safety, including airflow dynamics, ventilation sources, atmospheric conditions, gaseous compounds, nanoparticles, fine particles, pollutants, light sources, volatile chemical compounds, airborne and surface microbes.

By understanding how different aspects of a spatial environment affect human health, we can better design technologies that protect occupants in that space.

All our innovations, inspirations, and inventions are inspired by and guided by science.

Motive Lighting's vision is that public spaces shouldbe safe, protected, and trusted. We are drivento help set new expectations for safety and health in public areas, whether inside a classroom, at the office, or home.

We support educating the public about environmental quality and protection and how the air we breathe affects our health, cognition, well-being, and even lifespan.

Motive Lighting® Technology

Air Guardian® and CleanWhite® protect occupants within individual spaces.

Regardless of the built environment, design, ventilation challenges, or other variables that may affect air quality, Motive Lighting solutions protect occupants within those spaces frominfectious disease, pollutant health hazards,harmful light wavelengths, and dangerous gaseous compounds.

Indoor Air Quality - Guidelines and Regulatory Statutes

Guidelines and regulations for indoor air quality, including pollution, pathogens, specific molecular compounds found in ambient room air, and particle counts, will vary and include state or federal regulations.

Recommendations also exist for certain types of businesses, use cases, and structures.[2].

Certain states, such as California, have regulations, guidelines, and certification requirements for air purifiers and disinfection devices.

The Centers for Disease Control[3] may establish regulation[4]IAQ oversight groups, ASHRAE[5]REHVA, EPA, FDA, FIFRA, and APIC.

For information about Air Guardian's alignment and compliance with regulatory agencies, see:

https://www.motivelighting.com
and EPA, FDA, and other information here:

[2]Additional regulations, policies, procedures, and guidelines can include specific use-case settings - such as classrooms, air travel, oncology, pediatric, dental, dialysis, intensive care, operating rooms, clean rooms, and other areas.

November 1, 2021

Air Guardian®

Motive Lighting's Air Guardian® is a sealed Air Purification and Disinfection Device that uses multiple biophysical technologies to provide the highest level of protection for occupants within any space.

Everyone's health is affected by the environment in which we live our daily lives. How we travel, where we work, where we live, and where we socialize. In each of these settings - in each space - the air we breathe and how our bodies interact with the spatial environment can affect our health and well-being.

Air Guardian® helps create safer spaces by reducing and removing harmful gaseous compounds, nanoparticles, fine particles, pollutants, volatile chemical compounds, and airborne microbes.

Unlike any other device, Air Guardian® can eliminate microbial pathogens in a single pass through the device.

Air Guardian® doesn't just trap microbes and hazardous particles like HEPA (and MERV) filter-based systems – it completely kills and destroys microbes and other hazards before they reach the filter.

Science

Air Guardian's world-class[6] ultraviolet LEDs fill a patented matrix of special chambers with UV energies as high as 253 Watts. Scientific studies[7] have shown that as little as .0169 Watts can completely kill the SARS-CoV-2 virus.

As room air travels through Air Guardian's chambers, it is simultaneously exposed to a plasma-like cloud of super-oxide ions. These destructive oxides and ions are produced on over 9,256 square inches of surface area within the device.

Air Guardian® is the only device that can process air with such intense purification properties for such long periods (dose-time).

Air Guardian's chamber matrix uses fluid dynamic elements to retain air for extended durations – up to 22 seconds – so that full pathogenic and particle destruction can be completed.

Viruses, fungus, mold, bacteria, and spore forms are all destroyed within Air Guardian's high-energy and plasma-filled chambers.

Purified air is then released from multiple ceiling locations to create downward air displacement into the room.

This continuous downward displacement of air mass produces protective zones of air within the breathing strata. This downward venting process helps protect against disease transmission by continuously providing occupants with clean, safe air.

Product Offerings

Air Guardian® fixtures are available for commercial, retail, healthcare, transportation, hospitality, and other industries.

Air Guardian® fixtures are available in 2x2, 2x4, and portable designs.

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[6] From Seoul SETI (Viosys) http://www.seoulviosys.com/en/

[7] Biasin, M., Bianco, A., Pareschi, G. *et al.* UV-C irradiation is highly effective in inactivating SARS-CoV-2 replication. *Sci Rep* ***11***, 6260 (2021). https://doi.org/10.1038/s41598-021-85425-w

All fixtures are manufactured in the United States.

Fixtures are certified by ETL, CE, IUVA, and RoHS. Other certifications and registrations include:

California Air Review Board (CARB)[8], FDA Facility #10077990, EPA Establishment# 98105-TX-1, FDA Medica Device

Classification: Device Class II - Listing #D420497

Pathogenic Destruction list. These microbes and pathogens are killed within less than one second within the Air Guardian® device

Vibrio spp.
Vibrio vulnificus
Streptococcus pneumoniae
Staphylococcus aureus
Gram-Positive staphylococcus
Gram-Negative staphylococcus
Clostridium difficile
Streptococcus viridans
Pseudomonas aeruginosa
Legionella
Measles
Acinetobacter baumannii
Bacillus anthracis - Anthrax
Bacillus magaterium sp. (spores)
Bacillus magaterium sp. (veg.)
Corynebacterium diphtheriae
Ebertelia typhosa
Leptospiracanicola - infectious Jaundice
Micrococcus candidus
Micrococcus sphaeroides
Mycobacterium tuberculosis
Neisseria catarrhalis
Phytomonas tumefaciens
Proteus Vulgaris
Pseudomonas fluorescens
Salmonella enteritidis
Salmonella paratyphi
Salmonella typhosa
Bacillus paratyphusus
Bacillus subtilis spores
Bacillus subtilis
Typhimurium
Sarcina lutea
Serratia marcescens
Shigella dyseteriae – Dysentery
Shigella flexneri – Dysentery
Adenoviruses
Enteroviruses
Rotavirus
Influenza viruses
Rhinoviruses
Norovirus
Feline calicivirus (FCV)
Bacteriophage (MS2)
Infectious Hepatitis
Poliovirus - Poliomyelitis
Shigella paradysenteriae
Spirillum rubrum
Staphylococcus albus
Staphylococcus hemolyticus
Staphylococcus lactis
Stenotrophomonas maltophilia
Vibrio comma - Cholera
SARS-CoV-2 and all variants
Severe acute respiratory syndrome (SARS)
Middle East Respiratory Syndrome (MERS)
Tobacco mosaic
Aspergillius
Candida albicans
Candida Auris
Coccidioides
Cryptococcus neoformans
Cryptococcus gattii
Blastomyces
Penicillium
Rhizopus
Aspergillius flavus
Aspergillius glaucus

[8] 2x4 devices are CARB certified, 2x2 devices are pending certification

Aspergillius niger
Mucor racemosus A
Mucor racemosus B
Oospora lactis
Penicillium expansum
Penicillium roqueforti

Air Guardian® kills microbes in a single pass

Air Guardian® inactivates and destroys microbial pathogens within seconds or sub-seconds (depending on the device) while air moves through the multi-focal reaction chambers. Within these patented, sealed, and safe chambers, intense primary UV irradiation is emitted - along with multi-bounce secondary energies, which fill every cubic inch of space within the reaction chambers. Chemical clouds of oxidation are generated from up to 9,256 square inches of space within the chambers - intense clouds of reactive, destructive oxygen species.

Air Guardian® treats air for up to 22 seconds

Throughout the nano-reaction chambers, patented internal structures and elements within the device facilitate residency times that hold air for us to 22 seconds, increasing dose-times and oxidative exposure times.

These elements include fluid-dynamic-designed structures that influence air movement and collectively induce longer air residency within the device. The CFD elements slow airspeed, create turbulence, and produce vortices.

Air Guardian's breakthrough reaction chambers multiply ultraviolet light energy

All surfaces within the nano-reaction chambers are powder-coated with highly reflective nanoparticle crystals. A multi-focal mirroring effect is created, which induces random "bounce" and "spread" of LED photon energies. For example, all sides of the chamber are like mirrors, which reflect UV photons back and forth against the chamber walls. As photons bounce in a spreading pattern against the chamber walls, they retain a portion of their initial energy, up to 40% of the initial energy in the first photon bounce.

One might imagine a chamber, then, where continuous LED-emitted energies (as both photons and wavelengths) are crisscrossing the chamber in a seemingly endless number of bounces. Although the secondary bounces lose energy, the chamber is always filled with primary photon wavelengths as well, creating a chamber that is always filled with heterogenous UV-C energy waves; some at full energy and many more at varying degrees of partial energies. It effectively creates a 28-foot gauntlet of destructive UV-C dose energy. And rather than speeding through the gauntlet, Air Guardian® air is captured and processed for between 6 and 22 seconds, depending on the device.

The high kill curve that results means single-pass Log reductions that far exceed the ability of other systems to purify the air and disinfect the air. For example, a 50 CFM fan with a UV-C lamp pushes air across the lamp at a speed of 14.4 miles per hour - with a single-energy exposure time of .2 seconds.

What makes Air Guardian® different from other air purification and disinfection devices?

1) Air Guardian® is the **only commercially available, upper-room sealed UVGI device that will remove - not just filter - nearly all infectious pathogens** in an ingested cubic volume of air.

2) Air Guardian® can be installed either in the ceiling plenum or mounted on the ceiling surface and **is available in multiple form factors, including 2x2, 2x4, and portable form factors**.

3) Air Guardian® devices are pre-configured to be controlled as either a single device **or in tandem with up to four other devices from a single controller.** Aspects of the Air Guardian® device can be controlled by the end-user via the controller itself or the Vertices™ integrated IAQ sensor system (described below). The controllable aspects are on/off, dose energy, and fan speed.

4) **Air Guardian's patented fluid dynamic design elements** influence air ingestion rates, air residency rates within the device, and the temperature, volume, and spread of downward airflow.

5) Air Guardian's innovative fan design is uniquely **effective at drawing-room air, which helps stimulate upward air movement around the downward columns of vented and dispersed air within the breathing zone**.

6) **Upward air movement is also generated by Air Guardian®** through convection forces, which is created when cool air (two to four degrees F° cooler than ambient room air) is vented from the multiple supply sources, which are positioned well away from air induction locations. This is a function of exposing resident air to a titanium dioxide surface area equal to twenty to sixty-three square feet.

7) **The air temperature gradient between ingested and vented air is due to the known effects910 of TiO2 surface reflection and thermal absorption.** Thermal cooling is supplemented by fluid dynamic forces (airflow), near-zero surface friction, and the thermal shielding on the exterior of the Air Guardian® device shell, which enables the gradient between ambient room air and the interior of the device chambers.

8) The sum of Air Guardian's design elements enable more rapid ingestion of room air, enhanced air movement and convection upward, and **thus more frequent - and complete - room air changes (ACH) while using fewer devices than any other solution.**

9) Air Guardian's high kill-curve reduction rates and particle/chemical dissolution capability mean that **each room air change (ACH) is of higher value than an equivalent ACH from any other sealed UVGI solution.** Thus, room air change rates from other vendors may be a misleading measure of infection prevention and improved air quality and must be carefully considered.

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[99] B. Givoni, M.E. Hoffiman, Effect of building materials on internal temperatures, Research Report, Building Research Station, Technion Haifa, (1968).

(i) H. Taha, D. Sailor, H. Akbari, High albedo materials for reducing cooling energy use, Lawrence Berkeley Laboratory Report 31721, UC-530, Berkley CA, (1992). DOI: 10.2172/7000986

(ii) A. Seneca, A. Santamouris, W. Miller, A. Livada, A comparative study of the thermal performance of reflective coatings for the urban environment, in Proceedings of the International Conference Passive and Low Energy Cooling for the Built Environment, Santorini, Greece, (2005).

[10] https://www.scientific.net/KEM.545.95

10) With Air Guardian's innovative and patent-protected design**, a cubic volume of ambient room air has an extended period within the device, for a period of 6 to 22 seconds** (depending on the device model). During residency, the ingested air volume is exposed to powerful ultraviolet energies generated by proprietary UV-A and UV-C LED diodes.

11) Air Guardian® ultraviolet light energy is continually directed at microbial, particulate, and chemical air elements. **All captured air volume is exposed to UV energies and plasma-like oxidation forces on all chamber surfaces.**

12) Because of Air Guardian's proprietary diode and circuit design, the **UV-C dose wavelength is a narrow-band 265nm peak,** which has been proven in multiple studies to be the optimal wavelength for microbial destruction and the fastest kill-curve Log reductions.[11] **High-dose 265nm LED energy is considered to have the highest antimicrobial effects on pathogens**.

13) Warranties - Air Guardian® uses long-lasting proprietary LED diodes; the warranty for the diodes is 30,000 hours or more than three years of constant use. It is guaranteed never to shift off the 265nm wavelength during that time. **The device itself, excluding LEDs and fans, is warranted for the lifetime of the fixture.** The fans have a 50,000-hour warranty. These warranties reflect the superior grade of materials, manufacturing techniques, quality control, assembly, and design.

14) Maintenance - Air Guardian® has recommended periods for filter replacement, which depend on the use case. The filter replacement process is simple and device-accessible and is described in the installation and maintenance guideline document, which can be found at https://www.motivelighting.com.

15) The high single-pass Log reduction rate is the result of the intense dose of energy over time. **The ultraviolet light dose inside the reaction chambers is between 72 - 253 Watts.**

16) Photo-catalyzed oxidation is also highly destructive to microbial pathogens. The number of surface areas upon which the oxidative reactions occur is directly related to efficacy. On every square inch of surface, chemical "clouds" of highly Reactive Oxygen Species (similar to non-thermal plasma) continuously form. **As air passes through Air Guardian®, it is constantly exposed to these destructive plasma forces, which form on all surface areas - between 3,150 and 9,256 square inches.**

17) **Air Guardian's unique design enables a level of continuous and extensive oxidation not found in any other solution**. There are a few devices that add photo-catalysis in the form of filters embedded with nanoparticles, but they can only expose air to oxidation processes for sub-second periods - and they require frequent, often expensive filter replacement.

18) The Air Guardian® oxidation process uses rutile TiO^2 nanoparticles embedded in a permanent powder coating, which covers every square inch inside the fixture. Importantly, **oxidation is a primary method by which harmful chemical compounds and particles, often found in ambient air, are destroyed.** These include PM1.0, PM2.5, PM10, volatile organic compounds, ozone, and pollutant chemicals and gases. It also

[11] https://www.cdc.gov/niosh/nioshtic-2/20034387.html

destroys UFP (ultrafine particles) like PM 0.1 and nanoparticles like PM 0.3 (often called the most penetrating particle (MPP).

19) Air Guardian® **is available with a proprietary indoor air quality measurement system, Vertices™**, which is a patented multi-sensor circuit-board for monitoring real-time and periodic measurement values. LED lights of the device offer visual cues on air quality for each room so that any material change in air quality can be immediately recognized.

20) The air quality measures include **CO2, CO, TVOC, VOC, RH, PM1.0, PM2.5, PM10, smoke, temperature, and an aggregate AQI measure.** The user can monitor and control using a desktop application or an app that is approved for release in the Apple or Android app stores.

21) **Air Guardian® includes multiple final stages, vent, and exhaust filters that may be customized by use case and can include HEPA, Micron, MERV-6, and, usually, Charcoal**. In some models, an additional charcoal absorber material may be used in pre-filtration.

22) **Air is vented from multiple ceiling locations to create downward air displacement and to provide protective zones of air** within the breathing strata - this also dilutes all room air and ventilates even in unventilated rooms.

Device Model Specifications and characteristics

Model Type	3F	3FP	6F
Single module fan speed(export/import)	50-75	50-75	75-100
Total module fans in device	5	5	4
Entry module fans	1	1	2
Venting model fans in device	4	4 -(2 with diffuser)	2
CFM total fan speeds in device	200-300	200-300	300-400
Weight (lbs.)	11.1	11.1	24.4
Amps (10%)	0.78	0.78	1.65
Wattage	39.2	39.2	83
Voltage	122 to 277	122 to 277	122 to 277
Decibels	36	36	41
Total square feet, UV-C nanochambers	19	19	63
Total linear feet, UV-C nanochambers	18	18	28.7
Total linear inches, UV-C nanochambers	216	216	344.4
Total cubic inches, UV-C nanochambers	55,000	55,000	180,000
UV-C energy, milliwatts, in UV-C nanochambers	54,400	54,400	217,600
UV-A energy, milliwatts, in UV-A nanochambers	18,035	18,035	14,428
UV disinfection / purification energy, mW, all chambers	72,435	72,435	232,028
Square inches TiO2 surface area in UV-C nanochambers	2,750	2,750	9,000
Square inches TiO2 surface area in UV-A nanochambers	400	400	256
Total square inches of photocatalyzed TiO2 oxidation	3,150	3,150	9,256
Total square inches, UV-A nanochambers	80	80	64
Total cubic inches, UV-A nanochambers	320	320	256
UV-C wavlength, narrow band	265 nanometers	265 nanometers	2675 nanometers
UV-A wavelength, exact	365 nanometers	365 nanometers	365 nanometers
Photocatalyst, TiO2 powdercoat	Included	Included	Included
Proprietary TiO nantachnology	Included	Included	Included
Surface Reflectivity	89%	89%	89%
Activated carbon filters	2	2	2
HEPA filters (0.3 micron and 0.10 micron capable)	2	2	2

Motive Lighting CleanWhite® - antimicrobial LED Lighting

Motive Lighting's CleanWhite® solution is an innovative breakthrough in the ability to perform simultaneous, continuous, and safe surface disinfection

CleanWhite®'s visible light disinfection technology is safe for humans and pets and does not affect materials or fabrics.

Experiments and peer-reviewed studies performed over the last two decades have shown visible light disinfection to be effective against microbial species and pathogens.

Motive Lighting scientists have long recognized thethreat of surface microbes as a major diseasevector. Pathogenic reservoirs can be found in almost every space. They accumulate from gravity-induced microbial settlement and infectious contact.

Biofilms, which can contain communities of pathogens and organic materials, can develop from surface microbes and can be especially persistent.

CleanWhite® is the first system that can continually disinfect and destroy surface microbes – even persistent biofilms, and continue to kill and suppress new surface microbes.

Product Offerings

CleanWhite® fixtures are available for commercial, retail, healthcare, transportation, hospitality, and other industries. While several types of in-plenum fixtures are available, such as standard 2x2 and 2x4 troffer and panel lights, Motive Lighting can also produce custom fixtures for nearly any design. Our U.S manufacturing facility has been asked to produce custom fixtures for nearly every industry.

Motive Lighting's CleanWhite® panel fixture is also found as an integrated component of the Air Guardian® Plus fixture, which provides simultaneous and continuous air and surface disinfection.

The Science

Motive Lighting's CleanWhite® kills surface pathogens using spikes of precise wavelengths, at 405nm and at 470nm. Numerous studies have shown that these specific wavelengths, although safe for humans, have the ability to destroy microbes through various mechanisms, resulting in cell membrane damage – through catalyzed oxidation, permeability and leakage, and ion-pump dysfunction.

CleanWhite® only emits safe, visible white light into which "blue light" doses are embedded

Unlike other visible light surface disinfection systems, CleanWhite® can emit antimicrobial light wavelengths at any dose - without using visible purple-violet light

CleanWhite® only uses 405nm+470nm antimicrobial wavelength spikes; **Motive Lighting'spatented chips suppress harmful blue light wavelengths between 410-460 nanometers**

CleanWhite® Kills most latent surface microbes within the first few hours, then continuously suppresses re-growth. The two wavelengths (405+470) increase efficacy in shorter durations

CleanWhite® is also available as part of an integrated device solution sold as Air Guardian® Plus

CleanWhite® solutions include impurity-free polymer lenses, called illumiLens™, which

eliminate reflection of dose wavelengths back into the fixture

The following list demonstrates CleanWhite's ability to kill surface pathogens.

Salmonella spp.
Escherichia coli spp.
Vibrio vulnificus, Vibrio spp.
Streptococcus pneumoniae
Staphylococcus aureus (including MRSA)
Gram-Positive Staphylococcus spp.
Gram-Negative Staphylococcus spp.
Clostridium difficile
Streptococcus viridans
Pseudomonas aeruginosa
Listeria spp.
Legionella spp.
Measles
Acinetobacter baumannii
Bacillus anthracis - Anthrax
Bacillus magaterium sp. (spores)
Bacillus magaterium sp. (veg.)
Norovirus
Feline calicivirus[12] (FCV)

Because CleanWhite® wavelengths have also been shown to kill viral pathogens, such as noroviral and feline viral species, mechanisms of viral destruction (which has no porphyrin) have been postulated. Some feline viruses are considered proxies for the human coronavirus.

Microbial kill times

The CleanWhite® breakthrough is the ability to apply a continuous, safe, but substantial dose of antimicrobial energy, between 30-120 joules/cm2.

Operating continuously, these dose energies can rapidly kill or inactivate bacteria, yeast, mold, and some viral species – even in biofilm form. In a contaminated space, the time needed for high Log-reduction is between four to twenty-four hours, depending on the species and colony counts.

That said, many species of bacteria and microbes are reduced in high Log levels within 3-4 hours.

Studies by MacLean et al., 2009[13], show that many highly dangerous pathogens, such as A. baumannii, S. aureus, P. aeruginosa, E. coli, enterococci, and K. pneumoniae, can be **destroyed or inactivated by about 300 joules/cm2.**

Only CleanWhite® Technology, which can persistently deliver a dose of up to 120 joules/cm2, can provide enough saturated dose energy to destroy those pathogens, many of which are notoriously resistant threats recognized by the CDC[14] within just a few hours.

[12] This has been studied with some amounts of ORM present

[13] Hoenes K, Bauer R, Meurle T, Spellerberg B, Hessling M. Inactivation Effect of Violet and Blue Light on ESKAPE Pathogens and Closely Related Non-pathogenic Bacterial Species - A Promising Tool Against Antibiotic-Sensitive and Antibiotic-Resistant Microorganisms. *Front Microbiol*. 2021;11:612367. Published 2021 January 13. doi:10.3389/fmicb.2020.612367

[14] https://www.cdc.gov/drugresistance/biggest-threats.html

Air Guardian® Plus

Air Guardian® Plus (with CleanWhite®) is a unique, single-source breakthrough technology.

Air Guardian® Plus combines air and surface disinfection using an integrated device platform of Air Guardian® and CleanWhite®

Air Guardian® Plus functions can be controlled **manually or automatically, using Vertices sensor technology – including CleanWhite® lumen strength, antimicrobial dose, and periodicity of use.**

A single Air Guardian® Plus device can completely change and disinfect room air every few minutes while continuously destroying surface pathogens

No other device is available, worldwide, that can perform complete, safe, continuous surface and air disinfection like Air Guardian® Plus

CleanWhite™

Continuous Surface Disinfection

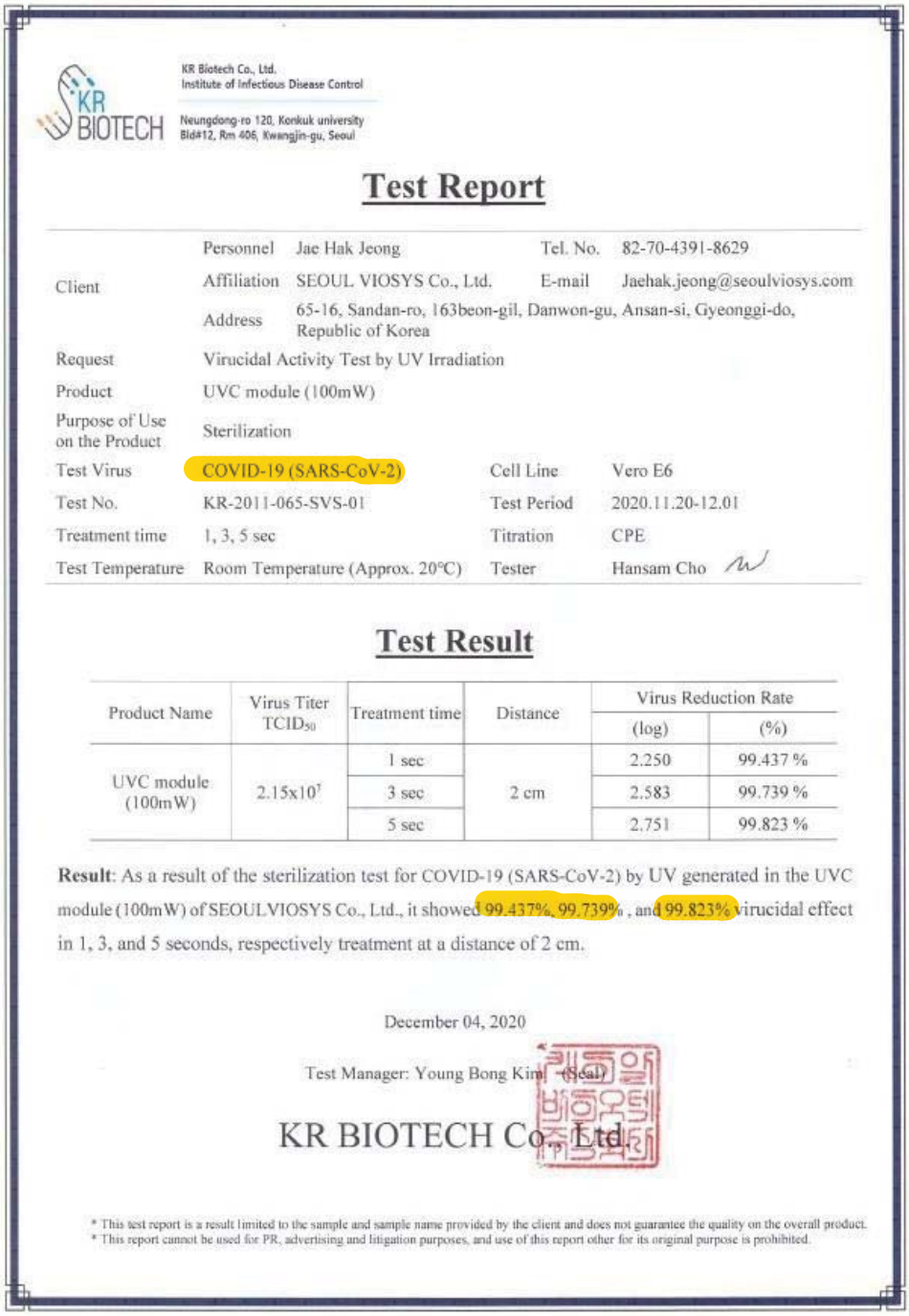
CleanWhite provides continuous surface disinfection using patented, antimicrobial white-illuminating LEDs which destroy over 99% of surface microbes, including bacteria, spore forms, fungi, mold, and other harmful pathogens.

Air Guardian Plus™

Dual-Modality Air + Surface Disinfection Technology

Combines Air Guardian and CleanWhite in a single fixture to provide both surface and air disinfection. Both Air Guardian and Air Guardian Plus offer integrated, real-time monitoring of indoor air quality with mobile app and dashboard.

The following test result illustrates the efficacy of the SETI VioLEDs used to irradiate the Air Guardian® channels. The results show that VioLED (Air Guardian) UV-C chips, which total 100 millijoules/cm2, kill SARS-CoV-2 human coronavirus in 1 second or less:



KR Biotech Co., Ltd.
Institute of Infectious Disease Control
Neungdong-ro 120, Konkuk university
Bld#12, Rm 406, Kwangjin-gu, Seoul

Test Report

Client	Personnel	Jae Hak Jeong	Tel. No.	82-70-4391-8629
	Affiliation	SEOUL VIOSYS Co., Ltd.	E-mail	Jaehak.jeong@seoulviosys.com
	Address	65-16, Sandan-ro, 163beon-gil, Danwon-gu, Ansan-si, Gyeonggi-do, Republic of Korea		
Request	Virucidal Activity Test by UV Irradiation			
Product	UVC module (100mW)			
Purpose of Use on the Product	Sterilization			
Test Virus	COVID-19 (SARS-CoV-2)		Cell Line	Vero E6
Test No.	KR-2011-065-SVS-01		Test Period	2020.11.20-12.01
Treatment time	1, 3, 5 sec		Titration	CPE
Test Temperature	Room Temperature (Approx. 20°C)		Tester	Hansam Cho

Test Result

Product Name	Virus Titer $TCID_{50}$	Treatment time	Distance	Virus Reduction Rate (log)	Virus Reduction Rate (%)
UVC module (100mW)	$2.15x10^7$	1 sec	2 cm	2.250	99.437 %
		3 sec		2.583	99.739 %
		5 sec		2.751	99.823 %

Result: As a result of the sterilization test for COVID-19 (SARS-CoV-2) by UV generated in the UVC module (100mW) of SEOULVIOSYS Co., Ltd., it showed 99.437%, 99.739% , and 99.823% virucidal effect in 1, 3, and 5 seconds, respectively treatment at a distance of 2 cm.

December 04, 2020

Test Manager: Young Bong Kim (Seal)

KR BIOTECH Co., Ltd.

* This test report is a result limited to the sample and sample name provided by the client and does not guarantee the quality on the overall product.
* This report cannot be used for PR, advertising and litigation purposes, and use of this report other for its original purpose is prohibited.

Other References

1. De Lucca, A. J., C. Carter-Wientjes, K. A. Williams, and D. Bhatnagar. 2012 "Blue light (470 nm) effectively inhibits bacterial and fungal growth" U.S. Department of Agriculture: Agricultural Research Service. Lincoln, Nebraska. http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2101&context=usdaarsfacpub
2. Guffey, J. S., and J. Wilborn, 2006. "In vitro bactericidal effects of 405 nm and 470 nm blue light," Photomedicine and Laser Surgery, vol. 24, no. 6, pp. 684-688.
3. Lipovsky A, Nitzan Y, Friedmann H, Lubart R. 2009. The sensitivity of Staphylococcus aureus strains to broadband visible light. Photochem Photobiol.85(1):255-260.
4. Lubart, R., A. Lipovsky, Y. Nitzan, and H. Friedmann. 2011. A possible mechanism for the bactericidal effect of visible light. Laser Ther. 2011; 20(1): 17-22.
5. Maclean M, MacGregor SJ, Anderson JG and Woolsey G. 2008. High-intensity narrow-spectrum light inactivation and wavelength sensitivity of Staphylococcus aureus. FEMS Microbiol Lett. 285(2):227-32.
6. Tegos, G.P., Demidova, T.N., Arcila-Lopez, D., Lee, H., Wharton, T., Gali, H. and Hamblin, M.R. 2005. Cationic fullerenes are effective and selective antimicrobial photosensitizers. Chem Biol 12, 1127-1135.

KEEP STUDENTS AND STAFF SAFE

The Air Guardian®

is a unique solution that continuously disinfects air from viruses, bacteria, mold, and fungi in occupied spaces.

The Air Guardian's airflow and convection dynamics ensure clean air is always exactly where it needs to be:

- The purified air is vented downward into occupied spaces.
- Airborne pathogens are displaced from the zone by the purified air and pushed upward towards the Air Guardian® to be purified and recirculated.

INTRODUCING THE AIR GUARDIAN®

A patented air purification, disinfection, and safety solution.

Air Guardian powered by illumipure

The device provides:

HOW THE AIR GUARDIAN® WORKS

01

Extraction

Uniquely designed fans draw air into a sealed TiO2 (titanium dioxide) coated disinfection chamber.

02

Oxidation

Biomatter and particles pass through a UVA photocatalytic nanoparticle filtration process.

03

Irradiation

Air travels through a multi-corridor chamber with a constant 265nm UVC spectrum.

04

Filtration

Clean, purified air is vented back into the occupied space through charcoal and micron filters.

KEEP STUDENTS AND STAFF SAFE

INTRODUCING THE IMMACULIGHT® SYSTEM

The total system combines the continuous air purification cycles of the Air Guardian® with the pathogen-fighting LED lighting of the illumiPure™ CleanWhite®

Both solutions work in conjunction with intelligent automation tools to effectively disinfect rooms whether they are occupied or not.

- Safe Non-UV Light
- Antimicrobial
- Simple Setup
- Intelligent Disinfection
- Certified Effective

EXPERIENCE SEAMLESS INDOOR DISINFECTION WITH THE MOTIVE LIGHTING AIR GUARDIAN®

01 Continuous surface and air disinfection

02 Room air changes with 99.9% disinfection, filtration, and purification

03 Kills SARS-CoV-2 in 9 seconds

04 Kills antibiotic-resistant pathogens and viral strains

05 Kills Clostridium difficile (C. diff) on surfaces and in the air

05 Destroys carcinogens and volatile chemical compounds

07 Kills fungus, fungal spores, mold, and mold spores

08 Removes endotoxins and odorous molecules

09 Promotes precise airflow dynamics, neutral pressure, and optimal room air changes

10 Customizable lighting solutions in fixture options and color temperature available for new construction or retrofit

The Air Guardian® provides students and staff peace of mind with purified air.

Let us help you offer a space where students gather safely and enjoy being together again.

MICROCHEM LABORATORY

STUDY REPORT

Study Title

Evaluation of Bioaerosols and Antimicrobial Efficacy of Calyx's Test Device

Test Method

Custom Aerosol Study

Study Identification Number

NG17595

Study Sponsor

John Higgins
CalyxPure
jchiggins@calyxpure.com

Test Facility

Microchem Laboratory
1304 W. Industrial Blvd
Round Rock, TX 78681
(512) 310-8378
Report Author: Samuel Hanley, B.S.

Purpose of the Study

The purpose of this study is to document the antimicrobial efficacy of Calyx's Test Device

Study Timeline

Devices Received	Cultures Initiated	Chamber Run	Nebulization Initiated and Treatment	Enumeration Plates Evaluated	Report Delivered
Baseline					
29 MAR 2021	08 APR 2021	08 APR 2021	08 APR 2021	09 APR 2021	21 APR 2021
Test					
29 MAR 2021	07 APR 2021	07 APR 2021	07 APR 2021	08 APR 2021	21 APR 2021

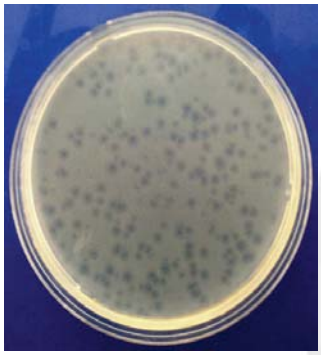
1304 W. INDUSTRIAL BLVD ROUND ROCK, TX 78681 | © 2016 | CONTACT@MICROCHEMLAB.COM | 512.310.8378

Test Device Information

Name of Test Device: Air Gaurdian
Manufacturer: Calyx pure

Test Microorganism Information

The following test microorganisms were selected for this test:



MS2 Bacteriophage (MS2), ATCC 15597-B1
This virus is a non-enveloped positive-stranded RNA virus of the bacteriophage family Leviviridae. Bacterial cells are the hosts for bacteriophages, and *E. coli* 15597 serves this purpose for MS2 bacteriophage. Its small size, icosohedral structure, and environmental resistance has made MS2 ideal for use as a surrogate virus (particularly in place of picornaviruses such as poliovirus and human norovirus) in water quality and disinfectant studies.
Permissive Host Cell System for MS2: *Escherichia coli*, 15597

Criteria for Scientific Defensibility of a Custom Device Study

For Microchem Laboratory to consider a Device Study study to be scientifically defensible, the following criteria must be met:

1. The average number of viable bacteria, fungi, or bacteriophage recovered from the time zero samples should be approximately 1 x 10^5 cells/m^3.
2. Positive/Growth controls must demonstrate growth of the appropriate test microorganism.
3. Negative/Purity controls must demonstrate no growth of test microorganism.
4. The neutralization test suspension must be ≥ 70% of that recorded for the neutralization control suspension count.

Passing Criteria

Because of the nature of the study, passing criteria may be determined by the Study Sponsor.

Testing Parameters used in this Study

Volume of inoculum added to Nebulizer	20.0 ml	Nebulization Time	60 minutes
Sampler Media (Volume)	Phosphate buffered saline (20.0 ml)	Neck Rinse Media (Volume)	Phosphate buffered saline (5.0 ml)
Sampling Time	10 minutes	Contact Times	Time zero 12 minutes 30 minutes 45 minutes 60 minutes
Sampling Type	Impingers, SKC biosamplers	Enumeration Media	50% TSA
Incubation Temperature	36±1°C	Incubation Time	12-24 hours

PARAMETERS

Study Notes:

1.0 ml of MS2 bacteriophage ATCC 15597-B1 stock, was added to 44.0 ml of Phosphate Buffered Saline and mixed. 20.0 ml of inoculum was added to each nebulizer on days that testing occurred.

Control Results

Neutralization Method: N/A
Growth Confirmation: Confirmed

Media Sterility: Sterile

Calculations

PFU/ml = (Average plate count) x 1:10 serial dilution factor

$PFU/m^3=[(CFU/ml \times V_s) \div (T_s \times 12.5\ L/min)] \times (1000\ L/m^3)$

Where:
V_S = Bio-sampler volume (ml)
T_S = Time sampled (min)

$$\text{Log}_{10}\text{Reduction} = \text{Log}\left(\frac{B}{A}\right)$$

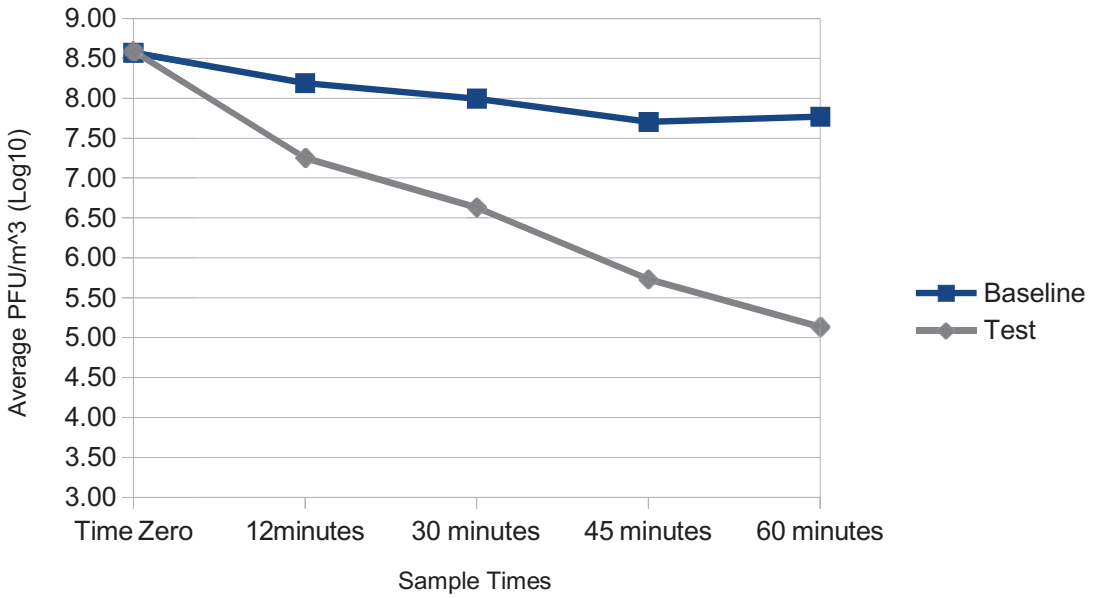
$$\text{Percent Reduction} = \frac{(B - A)}{B} \times 100\%$$

Where:
B = Number of viable test microorganisms at time zero after nebulization
A = Number of viable test microorganisms after the contact time

Results of the Study

Test Microorganism	Run Type	Test Device (Test Substance)	Sample Time Point	Replicate	PFU/m³	Average PFU/m³	Percent Reduction Compared to Time Zero	Log_{10} Reduction Compared to Time Zero	Adjusted Log_{10} Reduction [1] Compared to Baseline
MS2 Bacteriophage ATCC 15597-B1	Baseline	N/A	Time Zero	Replicate 1	3.04E+08	3.72E+08	N/A	N/A	N/A
				Replicate 2	4.41E+08				
			12 minutes	Replicate 1	2.01E+08	1.54E+08	58.50%	0.38	N/A
				Replicate 2	1.08E+08				
			30 minutes	Replicate 1	9.94E+07	9.56E+07	74.32%	0.59	N/A
				Replicate 2	9.19E+07				
			45 minutes	Replicate 1	4.88E+07	5.06E+07	86.40%	0.87	N/A
				Replicate 2	5.24E+07				
			60 minutes	Replicate 1	5.88E+07	5.86E+07	84.26%	0.80	N/A
				Replicate 2	5.84E+07				
	Test 1	Air Guardian	Time Zero	Replicate 1	1.27E+08	3.91E+08	N/A	N/A	N/A
				Replicate 2	6.54E+08				
			12 minutes	Replicate 1	1.59E+07	1.79E+07	95.41%	1.34	0.96
				Replicate 2	2.00E+07				
			30 minutes	Replicate 1	3.46E+06	4.28E+06	98.90%	1.96	1.37
				Replicate 2	5.11E+06				
			45 minutes	Replicate 1	5.52E+05	5.42E+05	99.86%	2.86	1.99
				Replicate 2	5.33E+05				
			60 minutes	Replicate 1	1.59E+05	1.37E+05	99.96%	3.46	2.65
				Replicate 2	1.15E+05				

The limit of detection for this assay is 8.00+01 PFU/m³ and values below the limit of detection are noted as "<8.00E+01" in the data table.
[1]The Log reductions for the Test Runs are adjusted to account for natural die-off and gravitational settling observed in the Control Run.



Additional Observations

Table 1. Chamber Temperature and Humidity

Chamber Run	Chamber Temperature (Start/End)	Humidity (Start/End)
Baseline	23.2ºC/23.3ºC	50%/52%
Test 1	24.2ºC/23.6ºC	53%/58%

The results of this study apply to the tested substances(s) only. Extrapolation of findings to related materials is the responsibility of the Sponsor.

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