

**Lee County Board Of County Commissioners
Agenda Item Summary**

Blue Sheet No. 20050674

1. ACTION REQUESTED/PURPOSE: Approve Project # PB050471, for the Lee County Transportation Department (Sign Shop Section), for the utilization (piggyback) of the Osceola County's Bid # A/R#05-412-TM, which has gone through their competitive bidding process, for the purchase of Sign Sheeting Material from the 3M Company, for the unit prices as listed on the awarded vendor's quote. This bid was awarded for one year from 2/21/05 to 2/21/06, and can be renewed upon agreement of both parties. Also request permission to continue to utilize this piggyback for any renewal periods between Osceola County and the awarded vendor. For general information, the Transportation Department (Sign Shop) estimates spending approximately \$275,000.00 for sign sheeting material on an annual basis. The requesting department will be responsible for monitoring their individual expenditures.

2. WHAT ACTION ACCOMPLISHES: Allows the Transportation Department (Sign Shop) to purchase sign sheeting material in a cost effective, efficient, and timely manner.

3. MANAGEMENT RECOMMENDATION: Staff recommends approval.

4. Departmental Category: <u>C 9 B</u>		5. Meeting Date: <u>05-31-2005</u>
6. Agenda: <input checked="" type="checkbox"/> Consent <input type="checkbox"/> Administrative <input type="checkbox"/> Appeals <input type="checkbox"/> Public <input type="checkbox"/> Walk-On	7. Requirement/Purpose: (specify)	
	<input type="checkbox"/> Statute	
	<input type="checkbox"/> Ordinance	
	<input checked="" type="checkbox"/> Admin. Code <u>AC-4-1</u>	
	<input type="checkbox"/> Other	
		8. Request Initiated: Commissioner _____ Department <u>Transportation</u> Division _____ By: <u>Scott Gilbertson</u>

9. Background:
The Division of Purchasing received from the Transportation Department (Sign Shop) a request to piggyback the Osceola County bid for sign sheeting material. The Sign Shop had been purchasing sign sheeting material under a State of Florida Term Contract (Dept. of Management Services), but that contract has expired and has been transferred to the Florida DOT procurement section, and could be delayed for some time. The prices on the Osceola County bid are good, and the Sign Shop has received both good service and a reliable product from the 3M Company over the years.

Account String: PD5410917500.505360

ATTACHMENTS:

1. Department Request to Piggyback
2. Osceola County Specification Package
3. Permission Letter - 3 M Company
4. Award letter from Osceola County
5. Awarded Vendor's quote package
6. Osceola County's Tab Sheet

10. Review for Scheduling:

Department Director	Purchasing or Contracts	Human Resources	Other	County Attorney	Budget Services				County Manager/P.W. Director
					Analyst	Risk	Grants	Mgr.	
<i>[Signature]</i>	<i>[Signature]</i> 5-11-05			<i>[Signature]</i>	<i>[Signature]</i> RKS/16	<i>[Signature]</i> 5/11/05	<i>[Signature]</i> 5/18/05	<i>[Signature]</i> 5/18/05	<i>[Signature]</i> 5/16/05

11. Commission Action:

- Approved
- Deferred
- Denied
- Other

Rec. by CoAtty
Date: <u>5/17/05</u>
Time: <u>11:20</u>
Forwarded To: <u>Admin S/1/05</u>

RECEIVED BY COUNTY ADMIN: <u>[Signature]</u>
COUNTY ADMIN FORWARDED TO:

Earl Pflaumer - Fwd: Piggy Back to Osceola Counties Florida Contract

From: Eva Sherer
To: Pflaumer, Earl
Date: 5/11/2005 8:28 AM
Subject: Fwd: Piggy Back to Osceola Counties Florida Contract

Hi Earl

Yesterday when I sent you the note to go ahead with the piggy backing of state contract, I miss quoted the name of who. It should be piggy backing from Osceola County Florida. contract for our 3M materials. sorry about the mis-wording of our last e-mail message where I quoted the State contract which is the wrong wording to use.

Sorry about the wrong wording.
Sincerely Eva Sherer

ATTACHMENT # 2

Bid No. A/R#05-412-TM	Due Date: December 28, 2005 @ 2:00 p.m.	Advertised Date: December 5, 2004
Buyer: Tammi Madison tmad@osceola.org	Respond to: Procurement Services, 1 Courthouse Sq., Suite 2300, Kissimmee, FL 34741 Phone: 407-343-3142 Fax: 407-343-3130	
Bid Title: Sign Materials & Road Markings		

SECTION A INSTRUCTIONS TO BIDDER

- A1. **Bid Price Sheet:** Each bidder shall furnish the information required on the Bid Price Schedule, Section F, and each accompanying sheet thereof on which he makes an entry. Offers submitted on any other format may be disqualified.
- A2. **Bid Submittal:** All bids must be submitted in a sealed envelope, plainly marked on the outside with the invitation to bid number, vendor's name and date and time of opening.
- A3. **Bid Copies:** All bids must be submitted in triplicate; one (1) original and two (2) copies. This includes specifically the bid cover page, any section on which annotations are required or exceptions are taken, the Bid Schedule, and any supporting documentation or literature being submitted with your bid.
- A4. It is the bidder's responsibility to assure that Bids are received in the Osceola County Procurement Services Office, 1 Courthouse Square, Suite 2300, Kissimmee, FL 34741, not later than 2:00 P.M. on the date ~~received~~. Any received after this date and time will not be accepted or considered, and will be returned unopened to the bidder. No telegraphic or facsimile offers will be considered. No offers will be accepted or received in any other Osceola County office.
- A5. Bids will be publicly opened and read aloud in the PROCUREMENT CONFERENCE ROOM on the above appointed date at 2:00 P.M. or as soon as possible thereafter.
- A6. Bids may not be withdrawn for a period of ninety (90) days after the bid opening date. However, bids may be withdrawn anytime before the bid opening. A bidder may withdraw his bid without prejudice to himself, not later than the day and hour set for opening of bids, by communicating his purpose in writing to the County and his bid will be returned to him unopened.
- A7. Bidders' attention is specifically called to the terms and conditions of this solicitation. As witnessed by your signature on the cover page and the proposal page(s) bidders, without exception, will be solely responsible for all aspects of the terms, conditions and special provisions of this solicitation.
- A8. **Unit Price Accuracy:** Please check your unit prices before submitting your bid, as no change in prices will be allowed after the opening. All prices and notations must be in ink or typewritten. In cases of the extended price irregularities, unit pricing will prevail. Please note that the County reserves the right to clarify and correct blatant unit price or extended amount errors.
- A9. **Proper Signatures:** Failure to sign and witness your signature may result in a disqualification of your bid. Please be sure your bid is signed, sealed and properly witnessed.
- A10. All items bid must be in total compliance with specifications. Alternate bids will not be considered unless they are specifically called for in this solicitation.
- A11. Bidders are advised that the County will not accept limitations on liability. The successful Bidder will be fully liable for all damages and events caused by them without any limitations as to dollar amount. The County will pursue liable Bidders to the extent allowed by law. Any bid received that limits liability to the amount of the bid or the resulting contract will be considered unresponsive and the bidder non-responsible and as such, the bid will not be accepted by the County.
- A12. **Protests:** The County abides by the parameters set forth in Florida Statutes (Chapter 120) relative to the consideration and addressing of valid bid protests. Any actual or prospective bidder who protests the reasonableness, award recommendation, necessity or competitiveness of the terms and/or conditions of the invitation to bid, selection or award recommendation shall file such protest in writing with the Procurement Services Director within three (3) business days after Board action/award.
- A13. **Questions:** Questions relative to interpretation of specifications or any aspect of the solicitation process, shall be addressed to the Procurement Representative, in writing, at least seven (7) calendar days before the bid opening date. Any interpretations, clarifications or changes made will be in the form of written addenda issued

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by the Procurement Services Department. Oral answers by any member of the Procurement Services Department or requesting department will not be authoritative and the County will not entertain any protests based on a verbal instruction.

- A14. It will be the responsibility of the bidder to contact the Procurement Services Department prior to submitting a bid to ascertain if any addenda have been issued, to obtain all such addenda, and to return executed addenda with their bid. The County will not consider requests to reopen a bid as a result of the failure of the bidder to secure addenda.
- A15. Bidders are requested to refrain from contacting the requesting/evaluating Departments or Divisions during the bid process. **ANY QUESTIONS FROM BIDDERS OR EVALUATING DEPARTMENTS/DIVISIONS MUST BE ADDRESSED TO THE PROCUREMENT SERVICES DEPARTMENT.**
- A16. Failure to comply with any of the foregoing instruction or any other essential element of this bid may result in disqualification of your bid.

SECTION B GENERAL PROVISIONS

- B1. **Receiving/Payment/Invoicing:** No payment will be made for materials ordered without proper purchase order authorization. Osceola County shall pay all vendors pursuant to and in accordance with the promulgations set forth by the State of Florida's Prompt Payment Act (Florida Statutes Section 218.70). Payment shall not be made until materials, goods or services, have been received, inspected and accepted by the County in the quality and quantity ordered. Payment will be accomplished by submission of invoice, in duplicate, with Purchase Order Number referenced thereon and mailed to the address set forth in the Purchase Order. Payment in advance of receipt of goods or services by Osceola County cannot be made.
- B2. **Fund Availability:** Any contract resulting from this solicitation is deemed effective only to the extent that appropriations are available. Pursuant to Florida Statutes all appropriations lapse at the end of the Fiscal Year. Multi-year awards shall be adequately funded but the County reserves the right not to appropriate for an ongoing procurement if it is deemed in its best interest.
- B3. **Occupational License:** The Tax Collector of Osceola County requires an Osceola County Occupational License. Please contact the Tax Collector/Occupational Licenses Office directly at 407-343-4000, for information concerning this requirement. In accordance with Florida State Statute 205.065, a current Department of Professional Regulation certificate may be provided in lieu of an Osceola County Occupational License, with a copy of the Occupational License of home state/county/city.
- B4. **Permits/Licenses/Fees:** Any permits, licenses or fees required will be the responsibility of the contractor.
- B5. **Taxes:** Osceola County does not pay Federal Excise nor State Sales taxes. Osceola County's tax exemption number is 85-8013132398C-5. Federal Exemption ID No. 59-6000780.
- B6. **Independent Pricing:** By submission of this bid, the bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, that in connection with this procurement:
- (a) The prices in this bid have been arrived at independently, without consultation, communication, collusion or agreement for the purpose of restricting competition, as to any matter relating to such prices with any other offeror or with any competitor.
 - (b) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly to any offeror or to any competitor; and
 - (c) No attempt has been made or will be made by the bidder to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition.

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- B7. **Inspection/Acceptance Title:** Inspection and acceptance will be at destination unless otherwise stipulated. Title and risk of loss or damage to all items shall be the responsibility of the shipper (vendor) until accepted by the using department of Osceola County, unless loss or damage results from negligence by Osceola County or it's using Department.
- B8. **The Contract:** Notice of an award by Osceola County will constitute acceptance of the Bid from the overall lowest priced, most responsive and responsible bidder. The Bid package signed by the successful bidder along with documentation included in the bidder's submittal as required by this Invitation to Bid and other additional materials submitted by the bidder and accepted by the County shall constitute the contract. A purchase order and/or other award document will be issued by the County when appropriate to do so.
- B9. **Laws Governing this Contract:** Any contractual arrangement between Osceola County and the vendor shall be consistent with, and be governed by, the ordinances of Osceola County, the whole law of the State of Florida, both procedural and substantive, and applicable federal statutes, rules and regulations. Any and all litigation arising under any contractual arrangement shall be brought in the appropriate court in Osceola County, Florida.
- B10. **Conflict of Interest:** All offerors must disclose with their offer the name of any officer, director, or agent who is also an officer or employee of Osceola County. Further, all bidders must disclose the name of any Osceola County officer or employee who owns, directly or indirectly an interest of ten (10%) percent or more of the bidder's firm or any of its branches. Failure to disclose in this manner will result in disqualification of your bid or cancellation of work. The County will seek damages for recoupment of losses in having to re-bid or re-assign.
- B11. **Additional Terms and Conditions:** No additional terms and conditions included with the bid response shall be evaluated or considered and any and all such additional terms and conditions shall have no force and effect and are inapplicable to this bid. If submitted either purposely through intent or design or inadvertently appearing separately in transmitting letters, specifications, literature, price lists, or warranties it is understood and agreed the general and special conditions in this solicitation are the only conditions applicable to this bid and the bidders authorized affixed to the bid signature section attests to this.
- B12. **Changes:** Osceola County reserves the right to order, in writing, changes in the work within the scope of the contract such as change in quantity or delivery schedule. The contractor has the right to request an equitable price adjustment in cases where changes to the contract under the authority of this clause result in increased costs to the contractor.
- B13. **Modifications:** In addition to modifications made under the changes clause, any contract resulting from this solicitation may be modified within the scope of the contract upon the written and mutual consent of both parties, and approval by appropriate legal bodies in Osceola County.
- B14. **Assignment & Subcontracting:** The vendor will not be permitted to assign its contract with Osceola County, or to subcontract any of the work requirements to be performed without obtaining prior written approval of Osceola County.
- B15. **Liability:** The vendor shall act as an independent contractor and not as an employee of Osceola County. The vendor will be required to indemnify, defend, and hold and save harmless Osceola County, its officers, agents, and employees, from damages arising from the vendor's performance of, or failure to perform, any task or duty required to be performed by the vendor.
- B16. **Termination for Default:** The performance of the Agreement may be terminated by Osceola County in accordance with this clause, in whole or in part, in writing, whenever the County shall determine that the contractor has failed to meet performance requirement(s) of the Agreement.

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B17. Termination for Convenience: Osceola County reserves the right to terminate the Agreement in whole or part by giving the vendor written notice at least thirty (30) days prior to the effective date of the termination. Upon receipt of termination from Osceola County, the vendor shall only provide those services specifically approved or directed by Osceola County. All other rights and duties of the parties under the Agreement shall continue during such notice period, and Osceola County shall continue to be responsible to the vendor for the payment of any obligations to the extent such responsibility has not been excused by breach of default of the vendor.

Upon termination, vendor shall bill Osceola County for all amounts not previously billed and due the vendor at that time. The vendor shall not be entitled to a professional fee nor expenses for any work commenced or expenses incurred after the notice of termination was received by the vendor, unless specifically approved or requested by Osceola County. The vendor shall, however, be entitled to payment for services commenced and approved by Osceola County prior to the receipt of notice, or with the express written consent of Osceola County, prior to the effective date of termination.

B18. Bid as Public Domain: All documents and other materials made or received in conjunction with this project will be subject to public disclosure requirements of Chapter 119, Florida Statutes. The bid will become part of the public domain upon opening. Vendors shall not submit pages marked "proprietary" or otherwise restricted.

B19. Force Majeure: Neither party to this agreement shall be liable to the other for any cost or damages if the failure to perform the agreement arises out of causes beyond the control and without the fault or negligence of the parties. Such causes may include, but are not restricted to, acts of God, fires, quarantine restriction, strikes and freight embargoes. In all cases, the failure to perform must be totally beyond the control and without any fault or negligence of the party.

B20. Indemnification: The successful proposer(s) agrees to hold harmless and indemnify the County from and against any and all claims, demands, actions, or causes of action, including, but not limited to, any and all costs, expenses, legal fees and liabilities incurred in and about the investigation and defense thereof, for personal injuries, including death or property damage suffered by any person, firm or corporation whatsoever and arising from or in any way connected with the negligent acts, negligent performance of the Agreement, willful misconduct, violation of law or breach of this Agreement by the successful proposer(s), their agent(s), servant(s), or employees under this Agreement.

The County agrees to hold harmless and indemnify the successful proposer(s) from and against any and all claims, demands, actions, or causes of action, including, but not limited to, any and all costs, expenses, legal fees and liabilities incurred in and about the investigation and defense thereof, for personal injuries, including death or property damage suffered by any person, firm or corporation whatsoever and arising from or in any way connected with the negligent acts of the County, its agents, servants or employees in assisting the successful proposer(s) in the performance of their obligations under this Agreement.

B21. Public Entities Crimes: A person or affiliate who has been placed on the convicted vendor list following a conviction for public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Florida State Statutes, Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list. By signature on this solicitation, vendor certifies that they are qualified to do business with Osceola County in accordance with Florida State Statute.

B22. Debarred Vendors: The County reserves the right to withhold award, rescind award or forego award to any vendor or contractor who is found to have been debarred from doing business with the State of Florida or any other public entity. It shall be County's sole determination as to the desirability of contracting with a contractor or vendor who has been debarred from doing business with any public entity.

B23. Contractor Responsibilities: The Contractor certifies, by submission of this bid that the Contractor will provide the services agreed upon in a timely and professional manner in accordance with specifications.

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B24. Equal Opportunity: Osceola County recognizes fair and open competition as a basic tenet of public procurement and encourages participation by minority and women owned business enterprises. The County requests minority and women owned business enterprises to submit evidence of such certification with submittals.

B25. Other Entity Use: All Bidders/Proposer submitting a response to this Invitation to Bid agree that such response also constitutes a bid to all governmental agencies, under the same conditions, for the same contract price, and for the same effective period as this bid, should the Bidder feel it is in their best interest to do so.

Each governmental agency desiring to accept these bids, and make an award thereof, shall do so independently of any other governmental agency. Each agency shall be responsible for its own purchases and each shall be liable only for materials and/or services ordered and received by it, and no agency assumes any liability by virtue of this bid/proposal.

This agreement in no way restricts or interferes with the right of any governmental agency to rebid any or all items.

B26. Public Emergencies: It is hereby made a part of this bid that before, during, and after a public emergency, disaster, hurricane, tornado, flood, or other acts of God that Osceola County shall require a "First Priority" for goods and services. It is vital and imperative that the majority of citizens are protected from any emergency situation that threatens public health and safety, as determined by the County. Vendor/contractor agrees to rent/sell/lease all goods and services to the County or governmental entities on a "first priority" basis. The County expects to pay a fair and reasonable price for all products and services rendered or contracted in the event of a disaster, emergency, hurricane, tornado or other acts of God.

SECTION C SPECIAL PROVISIONS

C1. Minimum Standard: Specifications listed herein describe the expected minimum standard. If any exceptions are taken, indicate on the bid form any deviations from the specifications and include any explanation or applicable literature. The absence of this indication shall be considered complete compliance with the listed specifications. These specifications are intended to be descriptive in nature and are not intended to eliminate any vendor from submitting a bid.

Note: Osceola County has standardized certain equipment and supply items. These items are bid as "only" and bidders are to bid only the product and model number specified. If the specified model number has been changed, bid the latest model number available. Alternate products provided by other manufacturers will not be considered.

C2. Bidder's Specifications: Each bidder shall make accurate statements in his bid, particularly as to types of products provided and any special requirements or options required for operation.

C3. Not Bidding: If not bidding any or all items, please so state.

C4. Firm Prices: Unit Prices for goods and/or services covered in the specifications shall be firm, net delivered to the ordering agency, F.O.B. DESTINATION (vendor paying all delivery costs) and shall remain firm for the period of any agreement reached as a result of this Annual Requirement.

C5. Period of Agreement: Agreement shall be awarded for a one (1) year term to begin upon approval and execution of the County.

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- C6. **Option to Extend/Renew:** The performance period of any contract or purchase order resulting from this invitation to bid may be extended upon mutual agreement between the vendor and Osceola County with no change in terms or conditions. Any extension of performance period under this provision shall be in one (1) year increments. Total contract length, including individual one (1) year extensions shall be in the County's best interest and sole discretion. Any agreement or amendment to the agreement resulting from this solicitation shall be subject to fund availability and mutual written agreement between the County and the successful bidder.
- C7. **Exercise of Option:** Exercise of option to extend term of contract: If the County wishes to enter into an option period, the County shall request from the contractor their written statement of desire to enter into an extension of the performance period.
- C8. **Acceptance of Goods/Services:** Receipt of goods/services shall not constitute acceptance. Final acceptance and authorization of payment shall be given only after a thorough inspection indicates that the product/performance meets bid specifications and conditions. Should the products/services differ in any respect from specifications, payment will be withheld until such time as the supplier takes necessary corrective action. If the proposed corrective action is not acceptable to the agency, the Procurement Services Office may authorize the recipient to refuse final acceptance of the goods/ services. Should a representative of Osceola County agree to accept the goods/services on condition that the contractor will correct his performance within a stipulated time period, then payment will be withheld until the services are performed as specified.
- C9. **Supervision:** The County shall not exercise any supervision or control over the Bidder's employees performing services under this contract. Such employees shall be accountable not to the County, but solely to the Bidder, who in turn is responsible to the County.
- C10. **Pre-award Inspection:** The County reserves the right to make a pre-award inspection of the bidder's facilities, to determine the capabilities of the bidder to service the County, prior to award of any agreement.
- C11. **Existing Permits and Identification Numbers:** Any permits and/or Dept. of Environmental Protection identification numbers are to be available for review upon request.
- C12. **Estimated Quantities:** Quantities noted in the Invitation to Bid are estimates only and in no way obligates Osceola County to purchase this amount. This estimate is intended as a guide in submitting your bid. The actual quantities purchased under this bid may be more or may be less. Quantities specified on Bid Price Schedule are for bidding purposes only.
- C13. **New Product:** Any and all products provided under this bid shall be new and unused.
- C14. **Inadequate Service:** In cases where services are not properly delivered, the contractor will either remedy the defect or be responsible for reimbursement of the difference to the County for the contractor selected to remedy the defect. Acceptance of materials or service shall remain the county's sole discretion.
- C15. **Additional Information:** The Osceola County Procurement Office reserves the right to request any additional information needed for clarification from any bidder/proposer for evaluation purposes.
- C16. **Insurance:** The contractor shall, during the entire period of performance of the contract resulting from this solicitation, procure and maintain at least the minimum kinds of insurance as stipulated in Attachment A. Proof of such insurance must be provided to the County prior to beginning of contract performance.
- C17. **Attachments:** All attachments are made an essential part of this bid.

Attachment A – Insurance Requirements
Attachment B – Statement of No Bid
Attachment C – Drug-Free Workplace
Attachment D - Specifications for Groups 16 - 28

NOTE: Attachment A must be complied with by the successful bidder. If you choose not to bid on this Invitation to Bid, please complete and return Attachment B.

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C18. Probationary Period: The first ninety (90) days of the contract are to be considered a "probationary" period. At the County's election, the successful bidder's contract may be terminated, based on the performance of the contractor, and a new award will be granted without another formal bid.

SECTION D AWARD OR REJECTION OF BIDS

D1. Award of Contract/Purchase Order: Award will be made to the responsible bidder most responsive to the solicitation with the lowest bid in one of the following methods: 1) An all or none bid, 2) awarded per lot or 3) item by item to the lowest bidder meeting specifications.

This bid may be awarded to a primary and alternate vendors. The primary vendor shall always be contacted first for all orders under this bid. If, at any time during the contract, the primary vendor cannot fulfill any given order they must contact the appropriate Osceola County representative immediately. Each order shall be filled by the primary vendor unless the County is notified otherwise. If any given order cannot be filled within the time constraints by the primary vendor, ONLY then shall the alternate vendor be contacted to fill the order. Regardless of which vendor fills the order, the respective prices, as bid, shall apply throughout the term of the contract.

D2. Split Award: Osceola County reserves the right to make award to one vendor, to split the award between vendors, or to not award some or all items, depending on the best interest of the County. The County may accept any item or group of items on any bid unless the offeror qualifies his bid by specific limitations.

D3. Estimated Dollar Amount: The estimated dollar amount to be expended during this bid period of twelve (12) months is \$352,000. Please note that this is an estimate only and in no way obligates the County to purchase this amount. This estimate is intended as a guide in submitting your bid. The actual quantities purchased under this bid may be more or may be less.

D4. Delivery: Delivery shall be a factor in the award. Failure to perform within delivery deadline(s) set forth in the specifications or any other contract document shall constitute default.

D5. Right to Reject: The County reserves the right to reject any or all bids, with or without cause, without recourse, to waive technicalities or to accept the bid which in its judgement best serves the interest of the County. Cost of submittal of this bid is considered an operational cost of the bidder and shall not be passed on to or be borne by the County. Osceola County also reserves the right to reject the bid of a bidder who has previously failed to perform properly or complete on time contracts of a similar nature, or who investigation shows is not in a position to perform the contract.

D6. Bid Results: The bid tabulation sheet should be available within 48 hours of the bid opening date and can be read from the Osceola County homepage at "<http://www.osceola.org>". If you do not have access to the Internet, you may contact DemandStar by Onvia at (800) 711-1712 for the results.

D7. Best Prices: Award will be made without further negotiation based upon competitive bids; therefore your best price should be submitted in response to this invitation to bid.

D8. Reasonable Prices: A reasonable unit price must be submitted for each work element. In the event that any pay item unit price is determined to be unreasonably low or unreasonably high, the bid may be declared non-responsive and may not be considered.

D9. Local Vendor Preference: According to Osceola County Administrative Code, Chapter 3, Section 3.09, (as applicable) all local vendors will be given a three percent (3%) preference in proposal prices. A local vendor is defined as a vendor who has an office or branch within the boundaries of Osceola, Orange, Seminole, Lake, Polk or Brevard County.

D10. Drug-Free Workplace Preference: Whenever two or more bids which are equal with respect to price, quality, delivery and services are received for procurement subject to the Osceola County Administrative Code, a bid received from a business that certifies that it has implemented a drug-free workplace program shall be given preference, in accordance with Florida State Statute 287.087. Certification of an implemented drug-free

Bid No. A/R#05-412-TM	Due Date: December 28, 2005 @ 2:00 p.m.	Advertised Date: December 5, 2004
Buyer: Tammi Madison tmad@osceola.org	Respond to: Procurement Services, 1 Courthouse Sq., Suite 2300, Kissimmee, FL 34741 Phone: 407-343-3142 Fax: 407-343-3130	
Bid Title: Sign Materials & Road Markings		

workplace program must be included with the bid when the bid is submitted. Further information regarding the Florida Statute is available in the Osceola County Procurement Services Office, (407) 343-3125.

- D11. **Determining Responsibility:** In determining responsibility, the following qualifications will be considered:
- The bidder's ability, capacity and skill to perform the contract or provide the service within the time specified.
 - The reputation, judgment and experience of the bidder.
 - The quality of performance of previous contracts or services including previous performance with the County.
 - Previous and existing compliance by the bidder with laws and ordinances relating to the contract or service.
 - Financial resources of the bidder to perform the contract or provide the service.
 - Ability to provide future maintenance and service for the use of the subject of the contract.
 - Whether the bidder is in arrears to the County on a debt or contract or is a defaulter on surety to the County, or whether the bidder's taxes or assessments are delinquent.

E TECHNICAL SPECIFICATIONS FOR SIGN MATERIALS

- E1. **SCOPE:** Provide and deliver street sign materials as they are ordered, meeting the specifications for use by Osceola County. Quantities listed are not firm requirements but are estimates to be used in pricing each bid for comparison purposes.

The specifications shown on the attached bid price sheets are intended to represent items of a quality level known to meet the County's requirements. While the County endeavors to promulgate written specifications that are accurate and non-restrictive for bidding purposes, they may also reference an item by manufacturer's name and stock number. Bidders are cautioned that in the event of a discrepancy therein, or if the materials being offered differ from that described, such difference must be timely questioned or noted in the bid in order that a fair evaluation may be performed.

No warranty is given or implied as to the quantities that will be purchased.

All materials are to be delivered to: Osceola County Road & Bridge Department
2350 Kissimmee Park Road
St. Cloud, FL 34769

Attachment A
INSURANCE REQUIREMENT

1. The successful bidder shall not commence any work in connection with this agreement until it has obtained all of the following types of insurance and such insurance has been approved by the COUNTY, nor shall the successful bidder allow any subcontractor to commence work on its subcontract until all similar insurance required of the subcontractor has been so obtained and approved. All insurance policies shall be with insurers qualified and doing business in Florida.
2. Loss Deductible Clause: The COUNTY shall be exempt from, and in no way liable for, any sums of money which may represent a deductible in any insurance policy. The payment of such deductible shall be the sole responsibility of the Contractor and/or subcontractor providing such insurance.
3. Worker's Compensation Insurance: The Contractor shall take out and maintain during the life of this Agreement, Worker's Compensation Insurance for all of its employees connected with the work of this project and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Worker's Compensation Insurance for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. Such insurance shall comply fully with the Florida Worker's Compensation Law. In case any class of employees engaged in hazardous work under this contract at the site of the project is not protected under the Worker's Compensation statute, the Contractor shall provide, and cause each subcontractor to provide, adequate insurance, satisfactory to the COUNTY for the protection of its employees not otherwise protected.
4. Contractor's Public Liability and Property Damage Insurance: The Contractor shall take out and maintain during the life of this Agreement Comprehensive Automobile Liability Insurance as shall protect it from claims for damage for personal injury, including accidental death, as well as claims for property damages, which may arise from operations under this Agreement whether such operations be by itself or by anyone directly or indirectly employed by it, and the amounts of such insurance shall be the minimum limits as follows:
 - (1) BODILY INJURY LIABILITY
 - \$500,000 operations each claim per person
 - \$500,000 completed operations each claim per person
 - (2) AUTOMOBILE PUBLIC LIABILITY
 - (a) Bodily Injury:
 - \$250,000 each claim per person
 - \$500,000 aggregate
 - (b) Property Damage:
 - \$100,000 each claim per person
 - \$100,000 aggregate
 - (3) PROPERTY DAMAGE LIABILITY (other than automobile)
 - \$500,000 each claim per person
 - \$500,000 operations per claim
 - \$500,000 protective per claim (covering automobile)
 - \$500,000 contractual per claim
5. Subcontractor's Public Liability and Property Damage Insurance: The Contractor shall require each of its subcontractors to procure and maintain during the life of this subcontract, insurance of the type specified above or insure the activities of his subcontractors in its policy, as specified above.
6. Owner's Protective Liability Insurance: The Contractor shall procure and furnish an Owner's Protective Liability Insurance Policy with the following minimum limits:
 - (1) BODILY INJURY LIABILITY
 - \$100,000 each claim per person
 - (2) PROPERTY DAMAGE LIABILITY
 - \$100,000 each claim per person
7. Certificates of Insurance: Certificate of Insurance Form will be furnished by the Contractor upon notice of award. These shall be completed by the authorized Resident Agent and returned to the Purchasing Department. This certificate shall be dated and show:
 - (1) The name of the insured contractor, the specified job by name and job number, the name of insurer, the number of the policy, its effective date, its termination date.
 - (2) Statement that the Insurer will mail notice to the COUNTY at least thirty (30) days prior to any material changes in provisions or cancellation of the policy.
 - (3) County shall be named or additional named insured on Public Liability Insurance and Automobile Liability Insurance.

**Attachment B
OSCEOLA COUNTY, FLORIDA
STATEMENT OF "NO BID"**

IF YOU DO NOT INTEND TO BID ON THIS REQUIREMENT, PLEASE COMPLETE AND RETURN THIS FORM PRIOR TO DATE SHOWN FOR RECEIPT OF BIDS TO: THE OSCEOLA COUNTY PURCHASING DEPARTMENT, 1 COURTHOUSE SQUARE, SUITE 2300, KISSIMMEE, FL 34741.

WE HAVE DECLINED TO BID ON A/R#05-412-TM, Sign Materials & Road Markings, FOR THE FOLLOWING REASON:

- _____ SPECIFICATIONS TOO "RESTRICTIVE", I.E., GEARED TOWARD ONE BRAND OR MANUFACTURER (PLEASE EXPLAIN BELOW).
- _____ INSUFFICIENT TIME TO RESPOND TO Invitation for Bid.
- _____ WE DO NOT OFFER THIS PRODUCT OR EQUIVALENT.
- _____ OUR PRODUCT SCHEDULE WOULD NOT PERMIT US TO PERFORM.
- _____ UNABLE TO MEET SPECIFICATIONS.
- _____ UNABLE TO MEET BOND REQUIREMENTS.
- _____ SPECIFICATIONS UNCLEAR (PLEASE EXPLAIN BELOW).
- _____ OTHER (PLEASE SPECIFY BELOW).

REMARKS: _____

WE UNDERSTAND THAT IF THE "NO BID" LETTER IS NOT EXECUTED AND RETURNED, OUR NAME MAY BE DELETED FROM THE LIST OF QUALIFIED BIDDERS FOR OSCEOLA COUNTY BOARD OF COUNTY COMMISSIONERS FOR FUTURE PROJECTS.

TYPED NAME AND TITLE: _____

COMPANY NAME: _____

ADDRESS: _____

SIGNATURE AND TITLE: _____

TELEPHONE NUMBER: _____ DATE: _____

FACSIMILE NUMBER: _____ E-MAIL ADDRESS: _____

ATTACHMENT AC@

GROUP 16: SPECIFICATIONS FOR ABRASION RESISTANT SUN COUNTRY, PRISMATIC REFLECTIVE PAVEMENT MARKER (STIMSONITE MODEL 911 OR EQUAL)

1.0 **General Description:** Markers shall consist of an acrylic plastic shell filled with a tightly adherent potting compound. The shell shall contain one or two glass covered prismatic reflective faces as required to reflect incident light from a single or opposite directions.

2.0 **Detailed Specifications:**

2.1 Design and Fabrication:

2.1.1 Dimensional Details: Overall dimensions 4 in. x 4 in. x 0.70 in. (10.16cm x 10.16cm x 1.78cm). Slope of Reflecting Face 30° Area of Each Reflecting Surface, 3.25 sq. in. (21.0 sq. cm).

2.1.2 Material: The shell shall be molded of methyl methacrylate conforming to Federal Specification L-P-380C, Type 1, Class 3.

Filler shall be a potting compound selected for strength, resilience, and adhesion adequate to pass physical requirements as outlined below.

2.1.3 Surface: Thin untempered glass shall be bonded to the prismatic reflective faces to provide an extremely hard and durable abrasion resistant surface. The area covered by the glass shall not be less than 3.00 sq. in. (19.35 sq. cm). The outer surface of the shell shall be smooth except for purposes of identification.

The base of the marker shall be substantially free from gloss and substances that may reduce its bond to adhesive. This shall be done by embedding sand or inert granules on the surface of the potting compound prior to curing.

3.0 **Optical Requirements:**

3.1 Definitions: Horizontal entrance angle shall mean the angle in the horizontal plane between the direction of incident light and the normal to the leading edge of the marker.

Observation angle shall mean the angle of the reflector between observer's line of sight and the direction of the light incident on the reflector.

Specific Intensity (S.I.) shall mean the candlepower of the returned light at the chosen observation and entrance angles for each foot candle of illumination at the reflector on a plane perpendicular to the incident light.

3.2 Optical Performance:

3.2.1 Steel Wool Abrasion Procedure: Form a 1 in. (2.54 cm) diameter flat pad using #3 coarse steel wool per Federal Specification FF-W-1825. Place the steel wool pad on the reflector lens. Apply a load of 50 lbs. (22 kg) and rub the entire lens surface 100 times. (Note: On two color units the red lens may not be covered with glass and if so should not be abraded.)

3.2.2 Specific Intensity: After abrading the lens surface, using the above steel wool abrasion procedure, the specific intensity of each white reflecting surface at 0.2° observation angle shall not be less than the following when the incident light is parallel to the base of the reflector.

Horizontal Entrance Angle	S.I.
0°	3.0
20°	1.2

For yellow reflectors, the specific intensity shall be 60% of the value for white. For red reflectors, the specific intensity shall be 25% of the value for white.

- 3.2.3 Optical Testing Procedure: A random lot of reflectors shall be tested. The reflector to be tested shall be located with the center of the reflecting face at a distance of 5 ft. (1.52m) from a uniformly bright light source having an effective diameter of 0.2 in. (0.51 cm).

The photocell shall be an annular ring 0.37 in. I.D. x 0.47 in. O.D. (0.94 cm I.D. x 1.19 cm O.D.) It shall be shielded to eliminate stray light. The distance from the light source center to the center of the photoactive area shall be 0.21 in. (0.53 cm). If a test distance of other than 5 ft. (1.52 m) is used, the source and receiver dimensions and the distance between source and receiver shall be modified in the same proportion as the test distance.

Failure of more than 4% of the reflecting faces shall be cause for the rejection of the lot.

4.0 Physical Properties:

- 4.1 Strength Requirements: Markers shall support a load of 2000 lbs. (909 kg.) as applied in the following manner:

- 4.1.1 Strength Testing Procedure: A random sample of three markers shall be selected for test purposes. Center the marker base down over the open end of a hollow metal cylinder 1 in. (2.5 cm) high, 3 in. (7.6 cm) I.D., 3.5 in. (8.9 cm) O.D. Apply a load to the top of the marker through a 1 in. (2.5 cm) diameter by 1 in. (2.5 cm) high metal plug centered on the top of the marker. Rate of loading shall be 0.2 in. (0.5 cm) per minute.

Failure shall constitute either breakage or significant deformation of the marker at any load of less than 2000 lbs. (909 kg).

4.2 Impact Test:

- 4.2.1 Sampling: A random sample of markers to provide 20 lenses for each test (40 total) shall be selected from each lot.

- 4.2.2 Impact Testing: Condition the markers in a convection oven at 130°F for one hour. While at the elevated temperature, impact the reflective face by allowing a 0.42 lb. (190 gm) dart fitted with a 0.25 in. (0.64 cm) radius spherical head to drop 18 in. (45.7 cm) perpendicularly onto the center of the reflective surface. Cracks in the impact area shall be generally concentric in appearance. There shall be no more than two radial cracks longer than 0.25 in. (0.64 cm). There shall be no radial cracks extending to the edge of the glass.

- 4.2.3 Temperature Cycling: Subject samples to 3 cycles of 140°F (60° C) for 4 hours followed by 20°F (-7° C) for 4 hours. There shall be no cracking or delamination following temperature cycling.

- 4.2.4 Tolerances: In either the impact or temperature cycling test, if 90% (18 lenses) of the test samples meet the above requirements, the lot shall be acceptable. Failure of 4 lenses of the sample shall be cause for rejection of the lot. Failure of 3 lenses shall necessitate a resample of 20 additional lenses. Failure of more than 1 lens of the resample shall be cause for rejection of the lot.

- 4.3 Bond Strength Test: Sand blast end of 2 in. (5.1 cm) diameter by 2-1/4 in. (5.7 cm) long steel test plugs with a threaded hole in the other end. Condition test plugs, pavement markers, and specified adhesive (Stimsonite Standard Set) at 73.4 ± 3.6°F (23° ± 2°C) for at least 4 hours before testing. Mix the specified adhesive until the mixture shows no streaks. Place adhesive on the center of the bottom surface of the marker and spread a layer of adhesive on the sandblasted surface of the test plug. Press plug firmly in the center of the marker with a twisting motion. With a squared end tool remove any adhesive which extrudes from under the plug. After 24 hours cure at 73.4° ± 3.6°F (23° ± 2°C) measure bond strength using a tensile testing machine adjusted to travel at .03 in. per minute. Test fixture shall be designed to provide uniform load distribution. Bond strength less than 500 psi (35.1 kg/cm²) shall be considered a failure.

ROUP 17: SPECIFICATIONS FOR DURABLE PRIMERLESS RETROREFLECTIVE PREFORMED PAVEMENT MARKINGS

0 Scope: This specification covers a high durability retroreflective pliant, polymer material designed for use as longitudinal markings, word/symbol markings, and transverse intersection markings such as crosswalks and stop bars, in areas of medium to high wear.

0 Materials - General:

- 2.1 The preformed markings shall consist of white or yellow films with pigments selected and blended to conform to standard highway colors through the expected life of the film. Glass beads shall be incorporated to provide immediate and continuing retroreflection.
- 2.2 The preformed markings shall be capable of being adhered to asphalt cement concrete (ACC) or Portland cement concrete (PCC) by a pre-coated pressure sensitive adhesive without the use of a primer to precondition the pavement surface. The preformed marking film shall mold itself to pavement contours by the action of traffic. Following proper application and tamping, the markings shall be immediately ready for traffic. The manufacturer shall identify all equipment necessary for proper application and make recommendations for application that will assure effective product performance. The preformed markings shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's instructions.

0 Classification: Primerless retroreflective preformed pavement marking film shall be used as transverse, channelizing, and symbol and legend markings subjected to medium to high traffic volumes.

0 Requirements:

- 4.1 **Composition:** The retroreflective pliant polymer pavement marking film shall consist of a mixture of high-quality polymeric materials, pigments and glass beads distributed throughout its base cross-sectional area, with a reflective layer of beads bonded to the top surface. The film shall have a pre-coated pressure sensitive adhesive that requires no surface preparation adhesive for application.
- 4.2 **Color:** The daytime color of the white film shall provide a minimum initial luminance factor, Y, of 80 and shall conform to the following chromaticity requirements:
 $x = 0.290, y = 0.315; x = 0.310, y = 0.295; x = 0.330, y = 0.360; x = 0.350, y = 0.340.$
- 4.3 The daytime color of the yellow film shall provide a initial luminance factor, Y, in range of 36 to 59 and shall conform to the following chromaticity requirements:
 $x = 0.474, y = 0.455; x = 0.491, y = 0.435; x = 0.512, y = 0.486; x = 0.536, y = 0.463$
- 4.4 Measurements shall be made in accordance with ASTM E 1349, using illuminant "C" and 0/45 (45/0) geometry. Calculations shall be in accordance with ASTM E 308 for the 2° standard observer.
- 4.5 **Reflectance:** The white and yellow films shall have the following initial minimum reflectance values as measured in accordance with the testing procedures of ASTM D 4061. The photometric quantity to be measured shall be coefficient of retroreflected luminance (R_L) and shall be expressed as millicandelas per square foot per foot-candle $[(mcd * ft^2) * fc^{-1}]$. The metric equivalent shall be expressed as millicandelas per square meter per lux $(mcd * m^{-2}) * lx^{-1}$.

	White			Yellow		
Entrance Angle	86.0°	86.0°	86.5°	86.0°	86.0°	86.5°
Observation Angle		0.2°	0.5°	1.0°	0.2°	0.5°
Retroreflected Luminance RL $[(mcd * ft^2) * fc^{-1}]$		550	380	300	410	250
					175	

- 4.6 **Acid Resistance:** The beads shall show resistance to corrosion of their surface after exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7 cc of concentrated acid into 1000 cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse. The test shall be performed as follows:

Take a 1" x 2" sample, adhere it to the bottom of a glass tray and place just enough acid solution to completely immerse the sample. Cover the tray with a piece of glass to prevent evaporation and allow the sample to be exposed for 24 hours under these conditions.

Then decant the acid solution (do not rinse, touch, or otherwise disturb the bead surfaces) and dry the sample while adhered to the glass tray in a 150°F (66°C) oven for approximately 15 minutes.

Microscopic examination (20X) shall show no more than 15% of the beads having a formation of a very distinct opaque white (corroded) layer on their entire surface.

4.7 Reflectivity Retention: To have a good, effective performance life, the glass beads must be strongly bonded and not be easily removed by traffic wear. The following test shall be employed to measure reflectivity retention:

4.7.1 Using a Taber Abraser with an H-18 wheel and a 125 gram load, the sample shall be inspected at 200 cycles, under a microscope, to observe the extent and type of bead failure. No more than 15% of the beads shall be lost due to popout and the predominant mode of failure shall be "wear down" of the beads.

4.8 Beads: The size, quality and refractive index of the glass beads shall be such that the performance requirements for the markings shall be met. The bead adhesion shall be such that beads are not easily removed when the material surface is scratched.

4.9 Bead Retention: The films shall have glass bead retention qualities such that when 2" x 6" sample is bent over a 1/2" diameter mandrel, with the 2" dimension perpendicular to the mandrel axis, microscopic examination of the area on the mandrel shall show no more than 10% of the beads with entrapment by the binder of less than 40%.

4.10 Skid Resistance: The surface of the retroreflective films shall provide an initial minimum skid resistance values of 45 BPN as measured by the British Portable Skid Tester in accordance with ASTM E 303.

4.11 Patchability: The pavement marking film shall be capable of use for patching worn areas of the same type of film in accordance with manufacturer's instructions.

4.12 Thickness: The film without adhesive shall have a minimum thickness of 0.06 inch (0.152 mm).

General Performance Considerations: The film, when applied according to the recommendations of the manufacturer, shall provide a neat, durable marking that will not flow or distort due to temperature if the pavement surface remains stable. The film shall be weather resistant and, through normal traffic wear, shall show no fading, lifting or shrinkage which will significantly impair the intended usage of the marking and shall show no significant tearing, roll back or other signs of poor adhesion.

ROUP 18: SPECIFICATION FOR FLUORESCENT WIDE ANGLE PRISMATIC RETROREFLECTIVE SHEETING (2 Types)

Scope: This specification covers flexible, colored, fluorescent wide angle prismatic retroreflective sheeting, tape and related processing materials designed to enhance the visibility of traffic control signs and objects under all driving conditions, day and night.

Classification: The sheeting shall be visible-activated fluorescent retroreflector providing higher daytime brightness than ordinary colored sheetings of similar chromaticity. The sheeting shall be of the following retroreflective types as specified in the plans or in the Invitation for Bid.

2.1 Type A: Type A sheeting is wide angle retroreflective sheeting with optimized performance over a broad range of observation angles. It is intended to provide high sign brightness especially at short sight distance where other sheetings do not.

2.2 Type B: Type B sheeting is a wide angle retroreflective sheeting with optimized performance at traditional observation angles and with extended entrance angle performance. It is intended to provide high sign brightness at long sight distance where other sheetings do not.

0. **Applicable Documents:** The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

3.1 ASTM Standards:

- 3.1.1 B-117 Method of salt spray (fog) testing.
- 3.1.2 B-209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.
- 3.1.3 D-523 Standard Method for Test for Specular Gloss.
- 3.1.4 E-284 Standard Definition of Terms Relating to Appearance of Materials.
- 3.1.5 E-308 Computing the Colors of Objects by Using the CIE System.
- 3.1.6 E-810 Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.
- 3.1.7 E-1164 Standard Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation.
- 3.1.8 E-991 Standard Practice for color Measurement of Fluorescent Specimens.

0 **Description:** The retroreflective sheeting shall have a smooth surface with a distinctive interlocking diamond seal pattern and datum orientation marks visible from the face. The sheeting shall be precoated with a pressure sensitive adhesive backing protected by a removable liner.

0 **Test Methods:**

- 5.1 Test Conditions: Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of $23 \pm 3^{\circ}\text{C}$ ($73^{\circ} \pm 3^{\circ}\text{F}$) and $50 \pm 5\%$ relative humidity for 24 hours prior to testing.
- 5.2 Test Panels: Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective material shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38 or 6061-T6 sheets in 0.05 cm (0.020 in.), 0.10 cm (0.040 in.) or 0.16 cm (0.063 in.) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied to the panels in accordance with the recommendations of the retroreflective sheeting manufacturer.

0 **Physical Requirements:**

6.1 Color Requirements:

- 6.1.1 Color Test: Conformance to daytime color requirements of Table 18-1 shall be determined instrumentally on sheeting applied to aluminum test panels, using a 2-monochromator spectrophotometer employing annular 45/0 (or equivalent 0/45) illuminating and viewing geometry.^{1,2} The total chromaticity coordinates and total luminance factor shall be calculated from the total spectral radiance factors computed for CIE illuminant D65 in accordance with ASTM E-308 "Practice for Computing the Colors of Objects by Using the CIE System" for the CIE 1931 (2°) standard colorimetric observer. The measurements shall be made on a Labsphere BFC-450 Bispectral Fluorescence Colorimeter or equivalent.

TABLE 18-1

Color Specification Limits for New Sheeting* (Daytime)

Sheeting	Chromaticity	Chromaticity	Chromaticity	Chromaticity	Total
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Color	Type	Coordinate 1		Coordinate 2		Coordinate 3		Coordinate 4		Luminance Factor Limit, Y	
Fluorescent allow green	A	0.387	0.610	0.460	0.540	0.421	0.486	0.368	0.539	60%	--
	B	0.387	0.610	0.460	0.540	0.421	0.486	0.368	0.539	55%	--

The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illuminant D65.

"Design and testing of a two-monochromator reference spectrofluorimeter for high-accuracy total radiance factor measurements" by Joanne C. Zwinkels, D.S. Gignac, M. Nevins, I. Powell, and A. Bewsher, Applied Optics, Vol. 36 no. 4, pp. 892-902 (1997).

"Principles of Bispectral Fluorescence Colorimetry" by Jim Leland, N. Johnson, and A. Arecchi, Proceedings of SPIE - The International Society for Optical Engineering: Vol. 3140, pp. 76-87 (1997).

6.2 Fluorescence Requirements:

- 6.2.1 Fluorescence Test: Conformance to fluorescence luminance factor requirements in Tables 18-2 and 18-4, shall be determined instrumentally, on sheeting applied to aluminum test panels, using a 2-monochromator spectrophotometer employing annular 45/0 (or equivalent 0/45) illuminating and viewing geometry.^{1,2} The fluorescence luminance factor shall be calculated from the fluorescence spectral radiance factors computed for CIE illuminant D65 in accordance with ASTM E-308 "Practice for Computing the Colors of Objects by Using the CIE System" for the CIE 1931 (2°) standard colorimetric observer. The measurements shall be made on a Labsphere BFC-450 Bispectral Fluorescence Colorimeter or equivalent.

Table 18-2

Minimum Fluorescence Luminance Factor - New Sheeting

Sheeting Type	Fluorescent Luminance Factor Limit, Y _F Min.
A	35%
B	35%

- 6.3 Coefficient of Retroreflection, R_A: The coefficients of retroreflection shall not be less than the minimum values specified in Tables 18-3A or 18-3B according to the sheeting type. Testing shall be in accordance with ASTM E-810 except that the angle of rotation shall be specified.

6.3.1 Units: Coefficients of retroreflection R_A shall be specified in units of candelas per lux per square meter.

6.3.2 The datum mark (arrow) imprinted on the face of the sheeting shall be the datum mark for test purposes. The testing shall be performed at 0° rotation and 90° rotation according to the tables below. For the 0° rotation angle, the direction of the datum mark shall be parallel to the entrance plane. For the 90° rotation angle the datum mark is perpendicular to the entrance plane.

TABLE 18-3A
For Type A Sheeting
Minimum Coefficient of Retroreflection R_A
(Candelas per lux per square meter)

Observation Angle	Rotation Angle	Entrance Angle		
		-4°	30°	45°
0.1°	0°	560	465	30
0.1°	90°	525	300	160
0.2°	0°	375	225	25
0.2°	90°	275	180	125
0.5°	0°	225	145	7
0.5°	90°	250	70	40
1.0°	0°	75	45	4
1.0°	90°	50	25	12

TABLE 18-3B
For Type B Sheeting
Minimum Coefficient of Retroreflection R_A
(Candelas per lux per square meter)

Observation Angle	Rotation Angle	Entrance Angle		
		-4°	30°	45°
0.2°	0°	660	475	120
0.2°	90°	700	300	100
0.5°	0°	220	135	60
0.5°	90°	175	70	45

- 6.4 **Gloss:** The retroreflective sheeting shall have an 85° specular gloss of not less than 50 when tested in accordance with ASTM D-523.
- 6.5 **Color Processing:** The retroreflective sheeting shall permit cutting and color processing with compatible transparent and opaque process colors in accordance with the sheeting manufacturer's recommendations at temperatures of 15° to 38°C (59 to 100°F) and relative humidities of 20% to 80%. The sheeting shall be heat resistant and permit force curing without staining of applied or unapplied sheeting at temperatures recommended by the sheeting manufacturer.
- 6.6 **Flexibility:** The retroreflective sheeting with the liner removed and conditioned as in 5.1 shall be sufficiently flexible to show no cracking when slowly bent, in one second's time, around a 3 mm (1/8 in.) mandrel, with the adhesive contacting the mandrel, at test conditions. Talcum powder shall be spread on the adhesive to prevent sticking to the mandrel.
- 6.7 **Adhesive:** The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solutions, without breaking, tearing, or removing any adhesive from the backing. The protective liner shall be easily removed following accelerated storage for 4 hours at 70°C (158°F) under a weight of .175 Kg/cm² (2.5 pounds per square inch). The adhesive backing of the retroreflective sheeting shall produce a bond to support a .80 Kg (1.75 pound) weight for 5 minutes without the bond peeling for a distance of more than 5.0 cm (2.0 inches) when applied to a test panel as described in 5.2. Apply 10 cm (4 inches) of a 2.5 cm x 15 cm (1" x 6") specimen to a test panel. Condition and then position the panel face down horizontally, suspend the weight from the free end of the sample and allow it to hang free at an angle of 90° to the panel surface for 5 minutes.
- 6.8 **Impact Resistance:** The retroreflective sheeting applied according to the sheeting manufacturer's recommendations to a test panel of alloy 6061 - T6, 0.10 cm (0.040 in.) by 7.5 cm (3 in.) by 12.5 cm (5 in.) and conditioned as in 5.1, shall show no cracking outside the impact area when the face of the panel is subjected to an impact of 11.3 Nm (100 inch-pounds) using a weight with a 1.6 cm (5/8 in.) diameter rounded tip dropped from a height necessary to generate an impact of 11.3 Nm, at test temperatures of both 0°C (32°F) and 22°C (72°C).

6.9 Resistance to Accelerated Outdoor Weathering: The retroreflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after 3 years unprotected outdoor exposure, facing the equator and inclined 45° from the vertical. Following weather exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection and the fluorescence luminance factor shall not be less than the values in Table 18-4A or 18-4B when measured at 0° rotation and 90° rotation. The color shall conform to the chromaticity coordinates of Table 18-1. The sample shall:

- 6.9.1 Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 0.8 mm (1/32 inch) shrinkage or expansion.
- 6.9.2 Where more than one panel of a color is measured, the coefficient of retroreflection shall be the average of all determinations.

TABLE 18-4A
For Type A Sheeting
Minimum Coefficient of Retroreflection R_A (cd/lux/m²)
and Fluorescent Luminance Factor Y_F after Accelerated Outdoor Weathering

Color	Warranty Period	Minimum Coefficient of Retroreflection, (R_A) cd/lux/m ²			Minimum Fluorescence Luminance Factor, Y_F
		Observation Angle	Rotation Angle	-40 Entrance Angle	
Yellow-Green	7 Years	0.2°	0°	190	20%
		0.2°	90°	140	
		1.0°	0°	40	
		1.0°	90°	25	

TABLE 18-4B
For Type B Sheeting
Minimum Coefficient of Retroreflection R_A (cd/lux/m²)
and Fluorescent Luminance Factor Y_F after Accelerated Outdoor Weathering

Warranty Color	Minimum Coefficient of Retroreflection, (R_A) cd/lux/m ²	Luminance	Minimum Fluorescence Factor, Y_F	
			Observation Angle	Rotation Angle
Yellow-Green	7 Years	0.2°	0°	330
			0.2°	90°

6.10 Optical Stability: Three pieces of retroreflective sheeting applied to test panels and conditioned as in Section 5.1 shall each first have their photometric properties characterized by measuring the coefficients of retroreflection according to the provisions in Section 6.2 at all test geometries shown in Table 18-3A for Type A Sheeting and Table 18-3B for Type B Sheeting. These panels shall then be exposed in an air circulating oven at 170 ± 5°F (77 ± 3°C) for a period of 24 hours. After exposure the panels shall be allowed to condition according to the provisions of Section 5.1. These panels will again be characterized for photometric properties by measuring the coefficients of retroreflection according to the provision of Section 6.2 at all test geometries measured before exposure.

The coefficients of retroreflection measured after exposure shall be between 85% and 115% of the values

measured before exposure for each of the three samples.

- 6.11 Resistance to Corrosion: The retroreflective sheeting applied to a test panel and conditioned as in 5.1, shall show no loss of adhesion, appreciable discoloration or corrosion and after cleaning shall retain a minimum of 80% of the original coefficient of retroreflection when measured at 0.2° observation, -4° entrance and 0° rotation angles after 1000 hours exposure to a 5% concentration salt spray at 35°C (95°F) when tested in accordance with ASTM B 117.
- 6.12 General Characteristics and Packaging: The retroreflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks and extraneous materials, and shall be furnished in either rolls or sheets. When furnished in continuous rolls, the average number of splices shall not be more than 3 per 50 yards (45.7 meters) of material with a maximum of 4 pieces in any 50 yard (45.7 meters) length. Splices shall be butted or overlapped and shall be suitable for continuous application as furnished. When furnished as cut sheets or sign faces, the sheeting shall be packaged flat in accordance with commercially accepted standards. The sheeting shall be packed snugly in corrugated fiberboard cartons, in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number and color. Stored under normal conditions the retroreflective sheeting as furnished shall be suitable for use for a minimum period of one year.

0 Sheeting Manufacturer's Warranty:

- 7.1 Certification: The sheeting manufacturer shall, upon request, submit with each lot or shipment, a certification which states that the material supplied will meet all of the requirements listed herein.
- 7.2 Field Performance Requirements:
- 7.2.1 *Fluorescent retroreflective sheeting which is used for vertically mounted traffic control and guidance signs which are processed and applied to aluminum sign blank materials in accordance with the sheeting manufacturer's recommendations, shall perform effectively for a minimum 7 years from the date of fabrication. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions by a driver with normal vision; or (2) the coefficient of retroreflection, after cleaning, is less than the minimums specified in Table 18-4A (for Type A Sheeting) or Table 18-4B (for Type B Sheeting); or (3) the fluorescence luminance factor after cleaning, is less than the minimums specified in Tables 18-4A or 18-4B.*
- 7.2.2 All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.
- 7.2.3 Natural causes include effects of exposure to weather. Natural causes exclude (without limitation) damage from exposure to chemicals, abrasion and other mechanical damage from fasteners used to mount the sign, collisions or mishandling.
- 7.3 Sheeting Manufacturer's Replacement Obligation:
- 7.3.1 Where it can be shown that the retroreflective sheeting fails to conform to the performance requirements of Section 7.2, the sheeting manufacturer's sole responsibility and purchaser's and user's exclusive remedy shall be:
- 7.3.1.1 If the failure occurs within the first 60 months from the date of fabrication, the sheeting manufacturer shall, at its expense, restore the sign surface to its original effectiveness.
- 7.3.1.2 If the failure occurs from the 61st to the 84th month from the date of fabrication, the sheeting manufacturer shall furnish the necessary amount of sheeting to restore the sign surface to its original effectiveness.
- 7.3.1.3 Replacement sheeting shall carry the unexpired warranty of the sheeting it replaces.

- 7.4 Process Inks: The manufacturer of the sheeting shall furnish at no additional cost the process inks, clears and thinners recommended for the sheeting to meet the performance requirements of this specification, and shall further be responsible for technical assistance in the use of these inks in accordance with section 8.
- 7.5 Slip Sheet: Slip sheet paper, if recommended by the sheeting manufacturer for sheeting surface protection or for use in packaging, storage or shipping finished signs, shall be furnished in rolls by the manufacturer at no additional charge, in at least equal dimension (square meters) and in the same widths as the sheeting supplied.
- 7.6 Washers: Washers, if recommended by the sheeting manufacturer to protect the sign surface from damage by bolts or other fasteners, shall be furnished by the manufacturer at no additional charge.

0 **Technical Assistance Requirements:**

8.1 Instruction and Training:

8.1.1 The manufacturer supplying the sheeting requirements shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by the agency. This instruction shall be available on a quarterly basis at no additional cost, and shall include but not be limited to, training films, material application, equipment operation, silk screening techniques, packaging, storage and other proven sign shop practices as they apply to the reflective sheeting supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications.

8.1.2 Additional on-site technical assistance by the manufacturer supplying the retroreflective sheeting shall be provided at each of the sign shops designated in the bid invitation. This assistance will be provided at least once during each quarter of sign production, if required.

8.2 Equipment: The manufacturer supplying the retroreflective sheeting requirements shall provide service for sheeting application equipment of their manufacture, certify that trained personnel will be available on 72 hours notice to render such service, and shall stock authorized parts for their sheeting application equipment. "Service" is understood to mean the capability of calibration and trouble shooting, as well as the training and retraining of personnel as required.

8.3 Compliance: Failure to comply with the requirements and schedules of 8.1 and 8.2 shall be cause for cancellation of contract.

GROUP 19: SPECIFICATION FOR TYPE III-D WIDE ANGLE PRISMATIC RETROREFLECTIVE SHEETING

1.0 **Scope**: This specification covers flexible white or colored, wide angle retroreflective sheeting, tape and related processing materials designed to enhance the day/night visibility of traffic control signs and objects.

2.0 **Classification**: The sheeting shall be of the following types as specified in the plans or in the Invitation for Bid.

2.1 Type A: Type A sheeting is wide angle retroreflective sheeting with optimized performance over a broad range of observation angles.

2.2 Type B: Type B sheeting is wide angle retroreflective sheeting with optimized performance at narrow observation angles and with extended entrance angle performance.

3.0 **Applicable Documents**: The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

3.1 ASTM Standards:

3.1.1 B 117 Method of salt spray (fog) testing.

3.1.2 B.209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.

3.1.3 D 523 Standard Method for Test for Specular Gloss.

- 3.1.4 E 284 Standard Definition of Terms Relating to Appearance of Materials.
- 3.1.5 E 308 Computing the Colors of Objects by Using the CIE System.
- 3.1.6 E 810 Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.
- 3.1.7 E 1164 Standard practice for Obtaining Spectrophotometric Data for Object-Color Evaluation.

3.2 CIE Publication Number 39-2 Recommendations for Surface Colours for Visual Signaling.

4.0 **Description:** The retroreflective sheeting shall have a smooth surface with a distinctive interlocking diamond seal pattern and datum orientation marks visible from the face. The sheeting shall be precoated with a pressure sensitive adhesive backing protected by a removable liner.

5.0 **Test Methods:**

- 5.1 **Test Conditions:** Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of $23 \pm 3^\circ \text{C}$ ($73^\circ \pm 3^\circ \text{F}$) and $50 \pm 5\%$ relative humidity for 24 hours prior to testing.
- 5.2 **Test Panels:** Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective material shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38 or 6061-T6 sheets in 0.05 cm (0.020 in.), 0.10 cm (0.040 in.) or 0.16 cm (0.063 in.) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied to the panels in accordance with the recommendations of the retroreflective sheeting manufacturer.

6.0 **Physical Requirements:**

6.1.1 **Color Test:** Conformance to color requirements of Table 19-1 shall be determined by instrumental method in accordance with ASTM E 1164 on sheeting applied to aluminum test panels. The values shall be determined on a HunterLab Labscan 6000 Q/45 Spectrocolorimeter with option CMR 559 [or approved equal Q/45 (45/0) instrument with circumferential viewing (illumination)]. Computations shall be done in accordance with ASTM E 308 for the 2° observer.

Table 19-1
Color Specification Limits¹ (Daytime)

Color	1		2		3		4		Min.	Max.
	X	Y	X	Y	X	Y	X	Y		
White	.305	.305	.355	.355	.335	.375	.285	.325	40	—
Yellow	.487	.423	.545	.454	.465	.534	.427	.483	24	45
Red ²	.690	.310	.595	.315	.569	.341	.655	.345	3	15
Blue	.078	.171	.150	.220	.210	.160	.137	.038	1	10
Green	.030	.398	.166	.364	.286	.446	.201	.794	3	9

¹The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illuminant D₆₅.

²Type A sheeting may not be available in Red.

6.2 **Coefficient of Retroreflection, R_A:** The coefficients of retroreflection shall not be less than the minimum values specified in Tables 19-2A or 19-2B according to the sheeting type. Testing shall be in accordance with ASTM E-810 except that the angle of rotation shall be as specified.

- 6.2.1 Units: Coefficients of retroreflection R_A shall be specified in units of candelas per lux per square meter (candelas per footcandle per square foot).
- 6.2.1 The observation angles shall be 0.2° and 0.5° . Type A shall also be measured at 0.33° and 1.0° observation.
- 6.2.3 The datum mark (arrow) imprinted on the face of the sheeting shall be the datum mark for test purposes. The testing shall be performed at 0° rotation unless otherwise noted. For the 0° rotation angle, the direction of the datum mark shall be parallel to the observation plane. For the 90° rotation angle the datum mark is perpendicular to the observation plane. It is recommended that signs are constructed with datum mark in a vertical position to maximize wide entrance angle performance.
- 6.2.4 For colored, transparent overlay films and for screen printed transparent color areas on white sheeting, the ratios of the R_A for the white to the R_A for the color, when measured at 0.2° observation, -4° entrance, and 0° rotation, shall be 5:1 to 15:1 for red, not less than 5:1 for blue and not less rotation, shall be 5:1 to 15:1 for red, not less than 5:1 for blue and not less than 5:1 for green when processed in accordance with the sheeting manufacturer's recommendations.

TABLE 19-2A - for Type A Sheeting
 Minimum Coefficient of Retroreflection R_A
 (Candelas per lux per square meter)

Observation Angle $^\circ$	Entrance Angle $^\circ$	White	Yellow	Blue	Green
0.20	-4	430	350	20	45
0.33	-4	300	250	15	33
0.50	-4	250	200	10	25
1.00	-4	80	65	4	10
0.20	30	235	190	11	24
0.33	30	150	130	7	18
0.50	30	170	140	7	19
1.00	30	50	40	2.5	5
0.20	40*	150	125	6	15
0.33	40*	85	75	4	8
0.50	40*	35	30	1.5	3.5
1.00	40*	20	17	0.7	2.0

* To be measured at 90° rotation

TABLE 19-2B- for Type B Sheeting
 Minimum Coefficient of Retroreflection R_A
 (Candelas per lux per square meter)

Observation Angle °	Entrance Angle °	White	Yellow	Red	Blue	Green
0.20	-4	800	660	215	43	80
0.20	30	400	340	100	20	35
0.20	45	145	85	25	7.6	12
0.20	60*	35	23	6.6	1.0	2.0
0.50	-4	200	160	45	9.8	20
0.50	30	100	85	26	5.0	10
0.50	45	75	60	18	2.8	6.0
0.50	60*	30	20	6.4	2.0	2.0

* To be measured at 90° rotation

- 6.3 Gloss: The retroreflective sheeting shall have an 85° specular gloss of not less than 50 when tested in accordance with ASTM D-523.
- 6.4 Color Processing: The retroreflective sheeting shall permit cutting and color processing with compatible transparent and opaque process colors in accordance with the sheeting manufacturer's recommendations at temperatures of 15° to 38° C (59 to 100° F) and relative humidities of 20% to 80%. The sheeting shall be heat resistant and permit force curing without staining of applied or unapplied sheeting at temperatures recommended by the sheeting manufacturer.
- 6.5 Flexibility: The retroreflective sheeting with the liner removed and conditioned as in 5.1 shall be sufficiently flexible to show no cracking when slowly bent, in one seconds' time, around a 3 mm (1/8 in.) mandrel, with the adhesive contacting the mandrel, at test conditions. Talcum powder shall be spread on the adhesive to prevent sticking to the material.
- 6.6 Adhesive: The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solutions, without breaking, tearing, or removing any adhesive from the backing. The protective liner shall be easily removed following accelerated storage for 4 hours at 70° C (158° F) under a weight of .175 Kg/cm² (2.5 pounds per square inch). The adhesive backing of the retroreflective sheeting shall produce a bond to support a .80 Kg (1.75 pound) weight for 5 minutes without the bond peeling for a distance of more than 5.0 cm (2.0 inches) when applied to a test panel prepared as in 5.2. Apply 10 cm (4 inches) of a 2.5 cm x 15 cm (1" x 6") specimen to a test panel. Condition and then position the panel face down horizontally, suspend the weight from the free end of the sample and allow it to hang free at an angle of 90° to the panel surface for 5 minutes.
- 6.7 Impact Resistance: The retroreflective sheeting applied according to the sheeting manufacturer's recommendation to a test panel of alloy 6061-T6, 0.10 cm (0.40 in) by 7.5 cm (3 in.) by 12.5 cm (5 in.) and conditioned as in 5.1, shall show no cracking outside the impact area when the face of the panel is subjected to an impact of 11.3 Nm (100 inch-pounds) using a weight with a 1.6 cm (5/8 in.) diameter rounded tip dropped from a height necessary to generate an impact of 11.3 Nm, at test temperatures of both 0° C (32° F) and 22° C (72° C).
- 6.8 Resistance to Accelerated Outdoor Weathering: The retroreflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after 2 years unprotected outdoor exposure, facing the equator and inclined 45° from the vertical. Following weather exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall not be less than the values in Table 19-3A or 19-3B when measured at 0° rotation and the colors shall conform to the requirements of Table 19-1. The sample shall:
- 6.8.1 Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than

0.8 mm (1/32 inch) shrinkage or expansion.

6.8.2 For Type A, be measured only at angles of : 0.2° observation, -4° entrance, and 0° rotation; and 1.0° observation, -4° entrance, and 0° rotation.

6.8.3 For Type B, be measured only at angles of: 0.2° observation, -4° entrance, and 0° rotation.

6.8.4 Where more than one panel of a color is measured, the coefficient of retroreflection shall be the average of all determinations.

TABLE 19-3A - for Type A Sheeting
Minimum Coefficient of Retroreflection R_A
after Accelerated Outdoor Weathering
(candelas per lux per square meter)

Color	Observation Angle ^o	Entrance Angle ^o	cd/lx/m ²
White	0.2	-4	250
	1.0	-4	45
Yellow	0.2	-4	200
	1.0	-4	35
Blue	0.2	-4	11
	1.0	-4	1.3
Green	0.2	-4	25
	1.0	-4	3

TABLE 19-3B - for Type B Sheeting
Minimum Coefficient of Retroreflection R_A
after Accelerated Outdoor Weathering
(candelas per lux per square meter)

Color	Observation Angle ^o	Entrance Angle ^o	cd/lx/m ²
White	0.2	-4	400
Yellow	0.2	-4	330
Red	0.2	-4	107
Blue	0.2	-4	22
Green	0.2	-4	38

9 Resistance to Heat: The retroreflective sheeting, applied to a test panel and conditioned as in 5.1, shall be measured in accordance with 6.2 at 0.2° observation and -4° entrance angles and 0° rotation and exposed to 77° ± 3°C (170° ± 5°F) for 24 hours in an air circulating oven. After heat exposure the sheeting shall retain a minimum of 70% of the original coefficient of retroreflection when measured at room temperature.

10 Resistance to Corrosion: The retroreflective sheeting applied to a test panel and conditioned as in 5.1, shall show no loss of adhesion, appreciable discoloration or corrosion and after cleaning shall retain a minimum of 80% of the original coefficient of retroreflection when measured at 0.2° observation, -4° entrance and 0° rotation angles after 1000 hours

exposure to a 5% concentration salt spray at 35° C (95°F) when tested in accordance with ASTM B 117.

11 General Characteristics and Packaging: The retroreflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks and extraneous materials, and shall be furnished in either rolls or sheets. When furnished in continuous rolls, the average number of splices shall not be more than 3 per 50 meters (54.7 yd.) of material with a maximum of 4 pieces in any 50 meter (45.7 yd.) length. Splices shall be butted or overlapped and shall be suitable for continuous application as furnished. When furnished as cut sheets or sign faces, the sheeting shall be packaged flat in accordance with commercially accepted standards. The sheeting shall be packed snugly in corrugated fiberboard cartons, in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number and color. Stored under normal conditions the retroreflective sheeting as furnished shall be suitable for use for a minimum period of one year.

0 **Performance Requirements and Obligations:**

7.1 Certification: The sheeting manufacturer shall, upon request, submit with each lot or shipment, a certification which states that the material supplied will meet all of the requirements listed herein.

7.2 Field Performance Requirements:

7.2.1 Retroreflective sheeting which is used for vertically mounted traffic control and guidance signs which are processed and applied to aluminum sign blank materials in accordance with the sheeting manufacturer's recommendations, shall perform effectively for a minimum of 7 years from the date of fabrication. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions by a driver with normal vision; or (2) the coefficient of retroreflection, after cleaning, is less than the minimums specified in Table 19-3A (for Type A Sheeting) or Table 19-3B (for Type B Sheeting).

7.2.2 All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

7.2.3 Natural causes include effects of exposure to weather. Natural causes exclude (without limitation) damage from exposure to chemicals, abrasion and other mechanical damage from fasteners used to mount the sign, collisions or mishandling.

7.2.4 For screen printed transparent colored areas on white sheeting, the coefficients of retroreflection shall maintain the ratios required by section 6.2.4.

7.3 Sheeting Manufacturer's Replacement Obligation:

7.3.1 Where it can be shown that the retroreflective sheeting fails to conform to the performance requirements of Section 7.2, the sheeting manufacturer's sole responsibility and purchaser's and user's exclusive remedy shall be:

7.3.1.1 If the failure occurs within the first 5 years from the date of fabrication, the sheeting manufacturer shall, at its expense, restore the sign surface to its original effectiveness.

7.3.1.2 If the failure occurs from the 61st to the 84th month from the date of fabrication, the sheeting manufacturer shall furnish the necessary amount of sheeting to restore the sign surface to its original effectiveness.

7.3.1.3 Replacement sheeting shall carry the unexpired warranty of the sheeting it replaces.

7.4 Process Inks: The manufacturer of the sheeting shall furnish at no additional cost the process inks, clears and thinners recommended for the sheeting to meet the performance requirements of this specification, and shall further be responsible for technical assistance in the use of these inks in accordance with section 8.

7.5 Slip Sheet: Slip sheet paper, if recommended by the sheeting manufacturer for sheeting surface protection or

for use in packaging, storage or shipping finished signs, shall be furnished in rolls by the manufacturer at no additional charge, in at least equal dimension (square meters) and in the same widths as the sheeting supplied.

- 7.6 Washers: Washers, if recommended by the sheeting manufacturer to protect the sign surface from damage by bolts or other fasteners, shall be furnished by the manufacturer at no additional charge.

Technical Assistance Requirements:

8.1 Instruction and Training:

8.1.1 The manufacturer supplying the sheeting requirements shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by the agency. This instruction shall be available on a quarterly basis at no additional cost, and shall include but not be limited to, training films, material application, equipment operation, silk screening techniques, packaging, storage and other proven sign shop practices as they apply to the reflective sheeting supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications.

8.1.2 Additional on-site technical assistance by the manufacturer supplying the retroreflective sheeting shall be provided at each of the sign shops designated in the bid invitation. This assistance will be provided at least once during each quarter of sign production, if required.

8.2 Equipment: The manufacturer supplying the retroreflective sheeting requirements shall provide service for sheeting application equipment of their manufacture, certify that trained personnel will be available on 72 hours notice to render such service, and shall stock authorized parts for their sheeting application equipment. "Service" is understood to mean the capability of calibration and trouble shooting, as well as the training and retraining of personnel as required.

8.3 Compliance: Failure to comply with the requirements and schedules of 8.1 and 8.2 shall be cause for cancellation of contract.

Government Using Agency Obligation: The using agency shall be responsible for the dating of all signs at the time of fabrication with the fabrication date so that the start of the warranty period can be determined. In the event of claims made under the warranty the agency shall notify the sheeting manufacturer of the failure within a reasonable time of the failure, provide reasonable information requested by the sheeting manufacturer and permit the manufacturer to verify the cause of the failure.

GROUP 20: SPECIFICATION FOR TYPE II ENCLOSED LENS RETROREFLECTIVE SHEETING

1.0 **Scope:** This specification covers flexible white or colored, engineering grade reflective sheeting which consists of enclosed spherical lens element embedded within a transparent plastic having a smooth flat outer surface. The sheeting shall have precoated adhesive protected by an easily removable liner.

2.0 **Classification:**

2.1 The reflective sheeting shall be an engineering grade reflective sheeting consisting of enclosed spherical lens elements embedded within a transparent plastic film having a smooth flat outer surface.

2.2 The sheeting shall have a precoated pressure sensitive adhesion (class 1), protected by an easily removable liner.

3.0 **Prequalification:**

3.1 Bidder's Requirements: All prospective bidders are hereby notified that the material proposed for submission or for use in production of finished traffic control signs and objects shall be a material of manufacture and product code or designation shown on the list of approved manufacturers of materials covered by this specification maintained by the Agency.

Prospective bidders or suppliers who wish to establish a performance history and prequalification for materials governed by this specification should contact the agency for instructions on samples and information required for testing.

- 3.2 Process Inks: The manufacturer of the sheeting being offered shall furnish at no additional cost the process inks, clears and thinners recommended for the sheeting to meet the performance requirements of this specification, and shall further be responsible for technical assistance in the use of these inks in accordance with Section 8, below.
- 3.3 Slip Sheet: Slip sheet paper, if recommended by the sheeting manufacturer for sheeting surface protection during heat vacuum application or for use in packaging, storing or shipping finished signs, shall be furnished in rolls by the manufacturer at no additional charge, in at least equal square footage and in the same widths as the sheeting supplied.
- 3.4 Temperature Indicators: Expendable temperature indicators, if recommended by the sheeting manufacturer for control and calibration of proper application temperature, shall be furnished by the manufacturer at no additional charge.
- 3.5 Washers: Washers, if recommended by the sheeting manufacturer to protect the sign surface from damage by bolts or other fasteners shall be furnished by the manufacturer at no additional charge.
- 3.6 Prequalification: Sheeting offered to the Agency shall be considered for qualification only when, in the opinion of the engineer, the material is capable of meeting the requirements of this specification; and the sheeting manufacturer provides certified test data showing that representative production material of the type to be supplied has met the requirements for accelerated outdoor weathering in section 6.9.

OR

The sheeting manufacturer provides documented evidence to the satisfaction of the engineer that representative production material of the type to be supplied has been used successfully in a substantial traffic signing program in similar climatic conditions for at least three years.

- 3.7 Handling/Processing Characteristics: Sheetings which may be used by the Agency in fabricating traffic control signs and objects will be evaluated for handling, screen printing, drying and application properties and compatibility with the agency's equipment and procedures.
- 3.8 Periodic Evaluation: Prequalified materials shall meet all requirements of this specification. Failure to do so as shown by periodic evaluation shall be cause for removal of that material from the list of prequalified materials.

4.0 **Applicable Documents**: The following documents, of the issues in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

- 4.1 B-209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- 4.2 E-97 Standard Method for Test for 45-degree 0-degree Directional Reflectance of Opaque Specimens by Filter Photometry.
- 4.3 D523 Standard Method for Test for Specular Gloss.
- 4.4 E-284 Standard Definition of Terms Relating to Appearance of Materials.
- 4.5 E-810 Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.

5.0 **Test Methods**:

- 5.1 Test Conditions: Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of 73 + 3° F (23 + 3° C) and 50 + 5% relative humidity for 24 hours prior to testing.

5.2 Test Panels: Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective material shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38 or 6061-T6 sheets on 0.020 inch (0.051 cm), 0.040 (0.102 cm) or 0.063 (0.160 cm) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied to the panels in accordance with the recommendations of the retroreflective sheeting manufacturer.

6.0 **Requirements:**

6.1 Color Requirements: Through instrumental color testing, the diffuse day color of the reflective material shall conform to the requirements of Table 20-1 and shall be determined in accordance with ASTM E-97, "Standard Method of Test for 45-Degree, 0-Degree Directional Reflectance of Opaque Specimens by Filter Photometry." (Geometric characteristics must be confined to illumination incident within 10 degrees of, and centered about, a direction of 45 degrees from the perpendicular to the test surface; viewing is within 15 degrees of, and centered about, the perpendicular to the test surface. Conditions of illumination and observation must not be interchanged.) The standards to be used for reference shall be the MUNSELL PAPERS designated in Table 20-1. The papers must be recently calibrated on a spectrophotometer. The test instrument shall be one of the following or approved equal:

- 6.1.1 GARDNER Multipurpose reflectometer or Model XL20 and XL23 Color and Color Difference Meter.
- 6.1.2 GARDNER Models AC-2a or XL23 Color Difference Meter.
- 6.1.3 MEECO Model V Colormaster.
- 6.1.4 HUNTERLAB D25 Color Difference Meter.

Table 20-1
COLOR SPECIFICATIONS LIMITS AND REFERENCE STANDARDS
FOR TYPE II ENCLOSED LENS SHEETING
 Chromaticity Coordinates
 (Corner Points)

Color	1		2		3		4		Reflectance		REF. STD. MUNSELL PAPERS
	X	Y	X	Y	X	Y	X	Y	Min.	Max.	
Silver-White	.305	.295	.360	.360	.338	.377	.280	.310	34.0		6.36Y 6.77/08
Yellow	.482	.450	.532	.465	.505	.494	.475	.486	29.0	40.0	1.25Y 6/12
Red	.602	.317	.664	.336	.644	.356	.575	.356	8.0	11.0	8.2R 3.78/14.0
Green	.140	.354	.179	.372	.147	.435	.120	.420	4.0	7.0	.65BG 2.84/8.4
Blue	.147	.075	.176	.091	.176	.151	.106	.113	1.0	2.4	5.8PB 1.32/6.8
Orange	.535	.875	.607	.393	.582	.417	.535	.399	20.0	30.0	2.5YR 5.5/14.0
Brown	.445	.353	.604	.396	.556	.443	.445	.386	3.8	7.7	5YR 3/6

6.2 Reflective Intensity: The reflective sheeting shall have minimum reflective intensity values at 0.2 degrees and 0.5 degrees, divergence, as shown in Table 20-3 expressed as candlepower per foot candle per square foot (candela per lux per square meter) of material. Reflective intensity shall be determined in accordance with ASTM E-810 for the minimum requirements of Table 20-3.

6.2.1 For screen printed transparent colored areas on white sheeting, the coefficients of retroreflection shall not be less than 50% of the values for corresponding color in the table below.

Table 20-3
MINIMUM REFLECTIVE INTENSITY VALUES FOR
TYPE II ENCLOSED LENS SHEETING

Divergence Angle (o)	Incidence Angle (o)	Silver-						
		White	Yellow	Red	Orange	Green	Blue	Brown
0.2	- 4	70.0	50.0	14.5	25.0	9.0	4.0	1.0
0.2	+30	30.0	22.0	6.0	7.0	3.5	1.7	0.3
0.5	- 4	30.0	25.0	7.5	13.5	4.5	2.0	0.35
0.5	+30	15.0	13.0	3.0	4.0	2.2	0.8	0.2

- 6.3 Specular Gloss: The retroreflective sheeting shall have an 85° specular gloss of not less than 40 when tested in accordance with ASTM-D523.
- 6.4 Color Processing: The retroreflective sheeting shall permit cutting and color processing with compatible transparent and opaque process inks at temperatures of 60 degrees F to 100 degrees F and relative humidity at 20 to 80 percent. Under these conditions, process color drying time shall not exceed twenty-four hours. The sheeting shall be heat-resistant and permit force curing without staining of applied or unapplied sheeting at temperatures as recommended by the manufacturer. All process colors shall be standard colors as required for Federal Signing Projects.
- 6.5 Shrinkage: A 9" x 9" retroreflective sheeting specimen with liner shall be conditioned a minimum of one hour at 72 degrees F and 50 percent humidity. The liner shall be removed and the specimen placed on a flat surface with the adhesive side up. Ten minutes after the liner is removed and again after 24 hours, the specimen shall be measured to determine the amount of dimensional change. The reflective sheeting shall not shrink in any dimension more than 1/32 inch in 10 minutes nor more than 1/8 inch in 24 hours.
- 6.6 Flexibility: The sheeting applied according to the manufacturer's recommendations to a clean etched 0.020 inch by 2 inch by 8 inch aluminum panel of Alloy 6061-T6 conditioned a minimum of 48 hours and tested at 72 Degrees F and 50 percent relative humidity shall be sufficiently flexible to show no cracking when bent around a 3/4 inch mandrel.
- 6.7 Adhesive:
- 6.7.1 The reflective sheeting shall include a pre-coated pressure sensitive adhesive backing (Class 1) that can be applied without necessity of additional adhesive coats on either the reflective sheeting or application surface.
- 6.7.2 The Class 1 adhesive backing shall be pressure sensitive adhesive of the aggressive tack type requiring no heat solvent or other preparation for adhesion to smooth clean surfaces.
- 6.7.3 The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solvents without breaking, tearing or removing any adhesive from the backing. The protective liner shall be easily removed following accelerated storage for 4 hours at 160 Degrees F under a weight of 2.5 pounds per square inch. The adhesive shall form a durable bond to both new and reclaimed aluminum association Alloys 6061-T6.
- 6.7.4 The adhesive backing of the reflective sheeting shall produce a bond to support a 1 3/4 pound weight for 5 minutes, without the bond peeling for a distance of more than 2.0 inches when applied to a smooth aluminum surface and tested as specified in Section 718 (FP-74) of the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects. Apply 4 inches of a 1" x 6" specimen to a test panel. Condition and then suspend the weight from the free end of the sample and allow it to hang free at an angle of 90 Degrees to the panel surface for 5 minutes.
- 6.8 Impact Resistance: The reflective sheeting, applied according to the sheeting manufacturer's recommendations to a cleaned, etched aluminum panel of alloy 6061 - T6, 0.04" (0.10 cm) by 3" (7.6 cm) by 5" (12.7 cm) and

conditioned as in 5.1, shall show no cracking when the face of the panel is subjected to an impact of a 2-inch diameter steel ball (1.19 lbs., 0.54 kg) dropped from a height of 8.5 inches (21.6 cm) through a 2.125 inch (5.4 cm) tube.

- 6.9 Resistance to Accelerated Weathering: Processed and applied in accordance with recommended procedures, the sheeting shall be subjected to accelerated weathering for 1,000 and 2,200 hours respectively, in accordance with ASTM Standard G23, Type E or EH Weatherometer. Following weather exposure, panels shall be washed in a 5% HC1 solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft cloth, brought to equilibrium at standard conditions and tested. The sample shall:

6.9.1 Show "good" colorfastness or better when tested as in 6.10,

6.9.3 Retain not less than 50% of the coefficient of retroreflection values shown in Table 20-3.

6.9.4 Not be removable from the aluminum panels without damage.

Retroreflective performance measurements after weather exposure shall be made only at angles of 0.2 degrees observation and -4 degrees entrance. Where more than one panel of a color is measured, the coefficient of retroreflection shall be the average of all the determinations.

- 6.10 Colorfastness: One specimen, exposed and prepared as specified in 6.9 shall be wet out with a mild detergent and water solution and compared with a similarly treated unexposed specimen under natural daylight or artificial daylight having a color temperature of 7600° Kelvin. The colorfastness shall be evaluated as follows:

- Excellent - No perceptible change in color.
- Good - Perceptible but no appreciable change in color.
- Fair - Appreciable change in color.

Appreciable change in color means a change that is immediately noticeable in comparing the exposed specimen with the original comparison specimen. If closer inspection or a change of angle of light is required to make apparent a slight change in color, the change is not appreciable.

- 6.11 General Characteristics and Packaging: The retroreflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks and extraneous materials, and shall be furnished in either rolls or sheets. When furnished in continuous rolls, the average number of splices shall not be more than three per 50 yards (45.7 m) of material with a maximum of four pieces in any 50-yard (45.7 m) length. Splices shall be suitable for continuous application as furnished.

When furnished as cut sheets or sign faces, the sheeting shall be packaged flat in accordance with commercially accepted standards. The sheeting shall be packed snugly in corrugated fiberboard cartons, in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number, color and type adhesive. Storage under normal conditions, the retroreflective sheeting as furnished shall be suitable for use for a minimum of one year.

- 6.12 Lens Elements: The retroreflective sheeting shall process stable and durable spherical lens elements which, from the film show no deterioration following submersion in a 5N solution of sulfuric acid for 30 minutes at 72 Degrees F.

Performance Requirements and Obligations:

- 7.1 Field Performance Requirements: Retroreflective sheeting, processed and applied to sign blank material in accordance with sheeting manufacturer's recommendations, shall perform effectively for the number of years stated in Table 20-5. The retroreflective sheeting shall be considered unsatisfactory if it has deteriorated due to natural causes to the extent that" (1) The sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimum specified for that sheeting during the period listed in the appropriate table on this page and page C29-20.

Table 20-5
MINIMUM COEFFICIENT OR RETROREFLECTION FOR
ENCLOSED LENS SHEETING
 Candelas per Foot Candle per Sq. Ft.
 (.2° obs, and -4° entrance)

Sheeting Color	Minimum Coefficient of Retroreflection	Satisfactory Performance Life (Years)
White	35.00	7
Yellow	25.00	7
Red	7.25	7
Blue	2.00	7
Green	4.50	7
	Orange	12.50
Brown	0.50	7

All measurements shall be made after sign cleaning according to sheeting manufacturer's recommendations.

For screen printed transparent colored areas on white sheeting, the coefficient of retroreflection shall not be less than 50% of the values for the corresponding color in Table 20-5.

7.2 Manufacturer's Replacement Obligation: Where it can be shown that retroreflective traffic signs with sheeting supplied and used according to the sheeting manufacturer's recommendations have not met the performance requirements of these specifications, the sheeting manufacturer shall replace the sheeting.

Technical Assistance:

8.1 Instruction and Training: The manufacturer supplying the retroreflective sheeting requirements shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility. This instruction shall be available on an annual basis at no additional cost, and shall include but not be limited to training films, material application, equipment operation, silk screening techniques, packaging, storage and other proven sign shop practices as they apply to the reflective sheeting supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications.

Additional on-site technical assistance by the manufacturer supplying the retroreflective sheeting shall be provided at each of the sign shops designated in the bid invitation. This assistance be provided at least once during each quarter if required.

8.2 Equipment: The manufacturer supplying the retroreflective sheeting shall provide service for his recommended sheeting application equipment of his manufacture, certify that trained personnel will be available on 72 hours notice to render such service and shall stock authorized parts for his sheeting application equipment. "Service" is understood to mean the capability of calibration and troubleshooting, as well as the training and retraining of personnel as required.

Compliance: Failure to comply with the requirements and schedules of these specifications shall be cause for cancellation of contract.

GROUP 21: SPECIFICATIONS FOR RETROREFLECTIVE PREFORMED PAVEMENT MARKING MATERIAL FOR CONSTRUCTION WORK ZONES

1.0 **Scope:** This specification covers a retroreflective pavement marking material on a flexible metallic backing, designed for use in construction work zones.

2.0 **Materials - General:**

- 2.1 The performed markings shall consist of white or yellow films with pigments selected and blended to conform to standard highway colors. Glass beads shall be incorporated to provide immediate and continuing retroreflection.
- 2.2 The size, quality and refractive index of the glass beads shall be such that the performance requirements for the markings shall be met. The glass bead adhesion shall be such that beads are not easily removed when the material surface is scratched with a thumbnail.
- 2.3 The performed marking materials shall be pre-coated with a pressure sensitive adhesive and shall be capable of being adhered to asphaltic concrete or portland cement concrete in accordance with the manufacturer's instructions without the use of heat, solvents or other additional adhesives, and shall be immediately ready for traffic after application.
- 2.4 The preformed marking materials shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

3.0 **Classification:** Retroreflective material designed for temporary markings which are not readily removable and are obliterated by over-paving or removal of the pavement on which they are placed.

4.0 **Material Requirements:**

- 4.1 Composition: The performed pavement marking material shall consist of a white or yellow retroreflective film on a conformable metallic backing, pre-coated with a pressure sensitive adhesive.
- 4.2 Reflectance: The white and yellow material shall have the following initial minimum reflectance values as measured in accordance with the testing procedure of ASTM D 4061. The photometric quantity to be measured shall be specific luminance (SL), and shall be expressed as millicandelas per square foot per foot-candle. The test distance shall be 50 feet and the sample size shall be a 2.0 ft. x 2.5 ft. rectangle.

Observation Angle	Entrance Angle	Specific Luminance	
		White	Yellow
0.2°	86°	1360	820
0.5°	86°	760	510

- 4.3 Skid Resistance: The surface of the retroreflective material shall provide an initial minimum skid resistance value of 35 BPN when tested according to ASTM E 303.
- 4.4 Adhesion: The Bidder may be required to demonstrate that the properly applied pavement marking material adheres to the roadway surface under climatic and traffic conditions normally encountered in construction work zones.
- 4.5 Abrasion Resistance: Samples of the test material shall not wear through to the conformable metallic backing surface in less than 125 cycles when tested in accordance with Federal Test Method Standards 141, Method 6192, except using an H-22 wheel and a 250 gram load.

5.0 Technical Assistance Requirements:

- 5.1 The Awardee shall make arrangements to have a qualified manufacturer's technician available to provide instruction and training at the facility designated by the user agency. This instruction and training shall be available on an annual basis at no additional cost and shall include, but not be limited to, product information, training films, material application, equipment operation, storage and other proven practices as they apply to preformed pavement marking materials for construction work zones.
- 5.2 In addition, the manufacturer shall provide both automatic and mechanical application equipment to the user agency, at no cost, for whatever period of time or number of occasions necessary. The manufacturer shall also provide services for the application equipment, certify that factory trained personnel will be available on 72 hours

notice to render such service, and stock authorized parts for the equipment.

GROUP 22: SPECIFICATIONS FOR REMOVABLE RETROREFLECTIVE PREFORMED PAVEMENT MARKING MATERIAL FOR CONSTRUCTION WORK ZONES

1.0 **Scope:** This specification covers a removable retroreflective pliant, polymer pavement marking material designed for temporary use in construction work zone.

2.0 **Materials - General:**

2.1 The performed markings shall consist of white or yellow films with pigments selected and blended to conform to standard highway colors. Glass beads shall be incorporated to provide immediate and continuing retroreflection.

2.2 The size, quality and refractive index of the glass beads shall be such that the performance requirements for the markings shall be met. The glass bead adhesion shall be such that beads are not easily removed when the material surface is scratched with a thumbnail.

2.3 The performed marking materials shall be precoated with a pressure sensitive adhesive and shall be capable of being adhered to asphaltic concrete or portland cement concrete in accordance with the manufacturer's instructions without the use of heat, solvents or other additional adhesives, and shall be immediately ready for traffic after application.

2.4 The preformed marking materials shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

3.0 **Classification:** Removable retroreflective pliant polymer material designed for temporary markings which can be readily removed when they are no longer applicable. They shall be capable of performing for the duration of a normal construction season and shall then be capable of being removed, intact or in large pieces, either manually or with a recommended roll up device.

4.0 **Material Requirements:**

4.1 Composition: The removable performed pavement marking material shall not contain metallic foil and shall consist of a mixture of high quality polymeric materials, pigments and glass beads distributed throughout its base cross-sectional area, with a reflective layer of beads bonded to the top surface. A non-metallic medium shall be incorporated to facilitate removal.

4.2 Reflectance: The white and yellow material shall have the following initial minimum reflectance values as measured in accordance with the testing procedure of ASTM D 4061. The photometric quantity to be measured shall be specific luminance (SL) and shall be expressed as millicandelas per square foot per foot-candle. The test distance shall be 50 ft. and the sample size shall be a 2.0 ft. x 2.5 ft. rectangle.

Observation Angle	Entrance Angle	Specific Luminance	
		White	Yellow
0.2°	86°	1770	1310
0.5°	86°	1270	820

4.3 Skid Resistance: The surface of the retroreflective material shall provide an initial minimum skid resistance value of 50 BPN when tested in accordance with ASTM E 303.

4.4 Removability: The material shall be removable from asphaltic concrete or portland cement concrete, intact or in large pieces, either manually or with a roll-up device, at temperatures above 40°F without the use of heat, solvents, grinding or blasting, and without scarring the pavement surface. The Bidder shall be able to show that the material has met this requirement after the following minimum traffic exposure based on transverse test decks with rolling traffic:

- 4.4.1 Time in place: 632 days
- 4.4.2 ADT per lane: 9,000 (23% trucks, 3.5 axles/unit)
- 4.4.3 Minimum axle hits: 13,000,000
- 4.5 Adhesion: The Bidder may be required to demonstrate that the properly applied pavement marking material adheres to the roadway surface under climatic and traffic conditions normally encountered in construction work zones.

5.0 Technical Assistance Requirements:

- 5.1 The Awardee shall make arrangements to have a qualified manufacturer's technician available to provide instruction and training at the facility designated by the user agency.

This instruction and training shall be available on an annual basis at no additional cost and shall include, but not be limited to, product information, training films, material application, equipment operation, storage and other proven practices as they apply to preformed pavement marking materials for construction work zones.
- 5.2 In addition, the manufacturer shall provide both automatic and mechanical application equipment to the user agency, at no cost, for whatever period of time or number of occasions necessary. The manufacturer shall also provide services for the application equipment, certify that factory trained personnel will be available on 72 hours notice to render such service, and stock authorized parts for the equipment.

GROUP 23: SPECIFICATION FOR TYPE IV WIDE ANGLE RETROREFLECTIVE SHEETING FOR THE WORK ZONE

1.0 Scope:

- 1.1 This specification covers flexible white or colored, wide angle retroreflective sheeting (hereinafter called sheeting), tape and related processing materials designed to enhance nighttime visibility of traffic control signs and devices used in construction work zones. The sheeting shall consist of optical lens elements adhered to a synthetic resin and encapsulated by a flexible transparent plastic that has a smooth outer surface. The sheeting shall have a precoated adhesive protected by an easily removable liner.
- 1.2 Printed colored areas of signs are covered only by section 6.2.4.

2.0 Classification:

The sheeting shall be of the following types as specified in the plans or in the Invitation for Bid:

- 2.1 Type A Sheeting: Type A sheeting (white, yellow, orange) is intended for use on reboundable plastic polyethylene substrate traffic control devices such as drums, tubes and posts used in construction and maintenance work zones.
 - 2.1.1 The sheeting shall have a precoated pressure sensitive adhesive (Class 1).
- 2.2 Type B Sheeting: Type B sheeting (white, yellow, orange and prestriped) is intended for use on rigid substrate signs and barricades used in construction and maintenance work zones.
 - 2.2.1 The sheeting shall have a precoated pressure sensitive adhesive (Class 1).
- 2.3 Type C Sheeting: Type C sheeting (white) is intended for use on plasticized polyvinyl chloride, such as cones, tubes and posts used in the construction and maintenance work zones.
 - 2.3.1 The sheeting shall have a precoated pressure sensitive adhesive (Class 1).

3.0 Prequalification:

3.1 Bidder's Requirements: All prospective bidders are hereby notified that the material proposed for submission or for use in production of finished traffic control signs and objects shall be a material of manufacture and product code or designation shown on the list of approved manufacturers of materials covered by this specification maintained by the Agency.

Prospective bidders or suppliers who wish to establish a performance history and prequalification for materials governed by this specification should contact the agency for instructions on samples and information required for testing.

3.2 Slip Sheet: Slip sheet paper, if recommended by the sheeting manufacturer for sheeting surface protection during heat vacuum application or for use in packaging, storing or shipping finished signs, shall be furnished in rolls by the manufacturer at no additional charge, in at least equal square footage and in the same widths as the sheeting supplied.

3.3 Temperature Indicators: Expendable temperature indicators, if recommended by the sheeting manufacturer for control and calibration of proper application temperature, shall be furnished by the manufacturer at no additional charge.

3.4 Washers: Washers, if recommended by the sheeting manufacturer to protect the sign surface from damage by bolts or other fasteners shall be furnished by the manufacturer at no additional charge.

3.5 Prequalification: Sheeting offered to the Agency shall be considered for qualification only when, in the opinion of the engineer, the material is capable of meeting the requirements of this specification.

3.6 Handling/Processing Characteristics: Sheetings which may be used by the Agency in fabricating traffic control signs and objects will be evaluated for handling, screen printing, drying and application properties and compatibility with the agency's equipment and procedures.

3.7 Periodic Evaluation: Prequalified materials shall meet all requirements of this specification. Failure to do so as shown by periodic evaluation shall be cause for removal of that material from the list of prequalified materials.

4.0 **Applicable Documents**: The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

4.1 ASTM Standards:

4.1.1 B-209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.

4.1.2 E-97 Standard Method for Test for 45-degree 0-degree Directional Reflectance of Opaque Specimens by Filter Photometry.

4.1.3 D-523 Standard Method for Test for Specular Gloss.

4.1.4 E-284 Standard Definition of Terms Relating to Appearance of Materials.

4.1.5 E-308 Standard Method for Computing the colors of objects by using the CIE system.

4.1.6 E-810 Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.

4.1.7 E-1164 Standard Practice for obtaining spectrophotometric data for object color evaluation.

5.0 Test Methods:

5.1 Test Conditions: Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of $73 \pm 3^{\circ}$ F ($23^{\circ} \pm 3^{\circ}$ C) and $50 \pm 5\%$ relative humidity for 24 hours prior to testing.

5.2 Test Panels: Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective material shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38 or 6061-T6 sheets on 0.020 inch (0.051 cm), 0.040 inch (0.102 cm) or 0.063 (0.160 cm) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied to the panels in accordance with the recommendations of the retroreflective sheeting manufacturer.

6.0 Physical Requirements:

6.1 Color Requirements: Color shall be specified and shall conform to the requirements of Table 23-1. Conformance to color requirements shall be determined spectrophotometrically in accordance with ASTM E 1164, with instruments utilizing either 45/0 or 0/45 illumination/viewing conditions and tolerances as described in ASTM E 1164 for retroreflective materials. CIE tristimulus values for the 2° observer and illuminant C shall be calculated in accordance with ASTM E 308.

Alternatively conformance to color requirements may be determined by instrumental method in accordance with ASTM E97, in which case geometric conditions must be confined to: Illumination incident within 10 degrees of and centered about a direction of 45 degrees from the perpendicular to the test surface, and viewing within 15° of, and centered about the perpendicular to the test surface. Conditions of illumination and viewing must not be interchanged. For this method, the test instrument shall be one of the following or an approved equal.

1. Gardner Multipurpose reflectometer or Model XL20 and XL23 Color and Color Difference Meter.
2. Gardner Models AC-2a or XL30 Color Difference Meter.
3. Meeco Model V Colormaster.
4. Hunterlab D25 Color Difference Meter.

For either method, material reference standards used to calibrate the test instrument shall be retroreflective reference standards which have been recently calibrated on a spectrophotometer; alternatively, the Munsell Papers designated in Table 23-1, and which have been recently calibrated on a spectrophotometer, may be used.

Table 23-1
Color Specification Limits* and Reference Standards

Color	X	Y	X	Y	X	Y	X	Reflectance Limit (Y)		Munsell Paper***	
								Y	Min.	Max.	
White **	.303	.287	.368	.353	.340	.380	.274	.316	27.0		5PB 7/1
Yellow	.498	.412	.557	.442	.479	.520	.438	.472	15.0	40.0	1.25Y 6/12
Orange	.550	.360	.630	.370	.581	.418	.516	.394	14.0	30.0	2.5YR 5.5/14

* The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illumination Source C.

** Silver white is an acceptable color designation.

*** Available from Munsell Color Company, 2441 Calvert Street, Baltimore, Maryland 21218. Catalog No. MCP-90040.

Table 23-2
Minimum Coefficient of Retroreflection
(Candelas per Footcandle per Square Foot)

Observation Angle (°)	Entrance Angle (°)	White	Yellow	Orange
0.2	- 4	250	170	100
0.2	+ 30	150	100	60
0.2	+ 50	75	40	25
0.5	- 4	95	62	30
0.5	+ 30	65	45	25
0.5	+ 50	35	20	10

- 6.2 **Coefficient of Retroreflection:** The coefficients of retroreflection shall be determined in accordance with ASTM E-810, for the minimum requirements of Table 23-2.
- 6.2.1 **Units:** Coefficients of retroreflection shall be specified in units of candelas per footcandle per square foot.
- 6.2.2 The observation angles shall be 0.2° and 0.5°.
- 6.2.3 The entrance angles shall be -4°, 30°, and 50°.
- 6.3 **Specular Gloss:** The retroreflective sheeting shall have an 85° specular gloss of not less than 50 when tested in accordance with ASTM-D523.
- 6.4 **Color Processing:** The retroreflective sheeting shall permit cutting and color processing with compatible transparent and opaque process colors in accordance with the sheeting manufacturer's recommendation at temperatures of 60 to 100°F (16 to 38°C) and relative humidity at 20 to 80%. The sheeting shall be heat resistant and permit force curing without staining of applied or unapplied sheeting at temperatures recommended by the sheeting manufacturer.
- 6.5 **Shrinkage:** A 9" x 9" retroreflective sheeting specimen with liner shall be conditioned a minimum of one hour at standard conditions. The liner shall be removed and the specimen placed on a flat surface with the adhesive side up. Ten minutes after the liner is removed and again after 24 hours, the specimen shall be measured to determine the amount of dimensional change. The reflective sheeting shall not shrink in any dimension more than 1/10" in 24 hours.
- 6.6 **Flexibility:** The reflective sheeting with the liner removed and conditioned 0°C for 24 hours prior to testing, shall be sufficiently flexible to show no cracking when slowly bent, in one second's time around a 1/8 inch mandrel with adhesive contacting the mandrel. Talcum powder shall be spread on the adhesive to prevent sticking to the mandrel.
- 6.7 **Adhesive:** The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solutions, without breaking, tearing, or removing any adhesive from the backing. The protective liner shall be easily removed following accelerated storage for four hours at 160°F (71°C) under a weight of 2.5 pounds per square inch (0.176 Kg/CM²). The adhesive backing of the retroreflective sheeting shall produce a bond to support a 1.75 pound (0.79 Kg) weight for 5 minutes without the bond peeling for a distance of more than 2 inches (5.08 cm) when applied to a test panel prepared as in 5.2. Apply 4 inches of 1" x 6" (2.54 cm x 15.2 cm) specimen to a test panel. Condition and then suspend the weight from the free end of the sample to allow it to hang free at an angle of 90° to the panel surface for 5 minutes.
- 6.8 **Impact Resistance:**
- 6.8.1 Type A and C sheeting material, applied according to the manufacturer's recommendations to a cleaned, etched aluminum panel of alloy 6061-T6, 0.040" by 3.0" by 5" and conditioned for 24 hours at 0° C, shall show no cracking when the face of the panel is subjected to an impact of a 4.0 pound weight with a 5/8" rounded tip dropped from a 100 inch-pound setting on a Gardner Variable Impact Tester, IG-1120.

6.8.2 Type B sheeting material, applied according to the manufacturer's recommendations to a cleaned, etched aluminum panel of alloy 5052-H38, 0.040" by 3.0" by 5" and conditioned for 24 hours at 0°C, shall show no cracking when the face of the panel is subjected to an impact of a 2.0 pound weight with a 5/8" rounded tip dropped from a 10 inch-pound setting on a Gardner Variable Impact Tester, IG-1120.

6.9 Resistance to Accelerated Aging on Vinyl: Retroreflective sheeting Type C only, when applied according to manufacturer's recommendations to a 2" x 5" portion of a fluorescent orange plasticized PVC traffic cone shall exhibit no appreciable discoloration after accelerated aging in a 150°F recirculating air oven for 168 hours. On completion of the oven aging, the exposed specimen shall be viewed alongside an unexposed specimen under simulated daylight illumination using a Macbeth viewing light. The aged specimen will also retain no less than 80% of the values in Table 23-2.

6.10 Coefficient of Retroreflection During Rainfall:

IMAGE NOT AVAILABLE

Figure 1. Test set up for rainfall test (source and photoreceptor in horizontal plane).

The coefficient of retroreflection of the retroreflective sheeting when totally wet, shall not be less than 90% of the dry values in Table 23-2. Wet performance measurements shall be made on new sheeting in accordance with the standard rainfall test below.

The coefficient of retroreflection under simulated rainfall conditions (wet performance) shall be determined using ASTM E-810 as in 6.2, but with the addition of the water nozzle setup as shown in Figure 1.

Place the test panels on which the sheeting has been applied in an upright position 6 inches below and 4 inches in front of the water nozzle.

Apply sufficient water pressure so that the upper surface of the spray envelope strikes the top of the specimen. With water falling on the specimen, determine the coefficient of retroreflection at angles of 0.2° observation and minus 4° entrance only. Where more than one panel of a color is measured, the coefficient of retroreflection during rainfall shall be the average of all the determinations.

6.11 General Characteristics and Packaging: The retroreflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks and extraneous materials, and shall be furnished in either rolls or sheets.

When furnished in continuous rolls, the average number of splices shall not be more than three per 50 yards (45.7 m) of the material with a maximum of four pieces in any 50-yard (45.7 m) length. Splices shall be butted or overlapped and shall be suitable for continuous application as furnished.

When furnished as cut sheets or sign faces, the sheeting shall be packaged flat in accordance with commercially accepted standards. The sheeting shall be packed snugly in corrugated fiberboard cartons, in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number, color and type of adhesive. Stored under normal conditions the retroreflective sheeting as furnished shall be suitable for use for a minimum period of one year.

Performance Requirements and Obligations:

7.1 Certification: The sheeting manufacturer shall submit with each lot or shipment, a certification which states that the material supplied will meet all the requirements listed herein.

7.2 Field Performance Requirements:

7.2.1 Purchaser should select a suitable test for determining reflective sheeting performance on reboundable plastic (polyethylene or plasticized PVC) substrates. Test should include plastic manufacturer's recommendation for impacting reboundable plastic traffic control devices*.

Type A and C sheetings shall be considered performing satisfactorily when after impact testing no loss of sheeting is experienced that would render the traffic control device ineffective for its intended use, when viewed from a vehicle.

- 7.2.2 Type B sheeting processed and applied to sign blank materials in accordance with sheeting manufacturer's recommendations, shall perform effectively for the number of years stated in Table 23-3 of this specification. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimum specified for that sheeting during that period listed in Table 23-3.

Table 23-3
Minimum Coefficient of Retroreflection
Candelas per Foot Candle per Sq. Ft.
(.2° obs, and -4° entrance)

Color	Min. Coeff. of Retroreflection 0.2° -4°	Years	
		Exposure	Vertical
White	200	3	
Yellow	136	3	
Orange	80	3	
Prestriped Barricade	200/80	3	

All measurements shall be made after sign cleaning according to sheeting manufacturer's recommendations.

- 7.3 Sheeting Manufacturer's Replacement Obligation: Where it can be shown that retroreflective traffic signs with Type B sheeting supplied and used according to the sheeting manufacturer's recommendations have not met the performance requirements of Section 7.2, the sheeting manufacturer shall replace the sheeting required to restore the sign or barricade to its original effectiveness, during the entire three years.
- 7.4 Government Using Agency Obligation: The using Agency shall be responsible for requiring the dating of all signs at the time of application. That date constitutes the start of the field performance obligation period.

0 Technical Assistance Requirements:

- 8.1 Instruction and Training: The manufacturer supplying the retroreflective sheeting requirements shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by the Agency. This instruction shall be available on a quarterly basis at no additional cost, and shall include but not be limited to training films, material application, equipment operation, silk screening techniques, packaging, storage and other proven sign shop practices as they apply to the reflective sheeting supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications. Additional on-site technical assistance by the manufacturer supplying the retroreflective sheeting shall be provided at each of the sign shops designated in the bid invitation. This assistance be provided at least once during each quarter of sign production if required.
- 8.2 Technical Service: The sheeting manufacturer shall, without additional cost to the Agency, provide the sign shops with competent technical service and product information, including service on screen printing problems with the inks furnished or recommended by the manufacturer for his/her sheeting.
- 8.3 Equipment: The manufacturer supplying the retroreflective sheeting requirements shall provide service for sheeting application equipment of his manufacturer, certify that trained personnel will be available on 72 hours notice to render such service, and shall stock authorized parts for his/her sheeting application equipment. "Service" is understood to mean the capability of calibration and troubleshooting, as well as the training and retraining of personnel as required.

- 8.4 Compliance: Failure to comply with the requirements and schedules of 8.1 and 8.2 shall be cause for cancellation of contract.

GROUP 24: SPECIFICATION FOR TYPE III-A WIDE ANGLE RETROREFLECTIVE SHEETING

- 1.0 **Scope**: This specification covers flexible white or colored, wide angle retroreflective sheeting (hereinafter called sheeting), tape and related processing materials designed to enhance nighttime visibility of traffic control signs and objects. The sheeting shall consist of optical lens elements adhered to a synthetic resin and encapsulated by a flexible transparent plastic that has a smooth outer surface. The sheeting shall have a precoated adhesive protected by an easily removable liner.
- 2.0 **Classification**: The sheeting shall be of the following types as specified in the Invitation for Bid.
- 2.1 Type A Sheeting: Type A sheeting is intended for shop production of new stationary traffic control signs or objects, exclusive of those used for construction and maintenance work zones.
- 2.1.1 The sheeting shall have a precoated pressure sensitive adhesion (class 1), protected by a easily removable liner.
- 2.2 Type B Sheeting: Type B sheeting is intended for use on stationary traffic control signs and objects; it is Type A sheeting, prepunched for use in electronic cutting devices made by Gerber Scientific Products, Inc.
- 2.2.1 The sheeting shall have a precoated pressure sensitive adhesion (class 1), protected by a easily removable liner.
- 3.0 **Prequalification**:
- 3.1 Bidder's Requirements: All prospective bidders are hereby notified that the material proposed for submission or for use in production of finished traffic control signs and objects shall be a material of manufacture and product code or designation shown on the list of approved manufacturers of materials covered by this specification maintained by the Agency.
- Prospective bidders or suppliers who wish to establish a performance history and prequalification for materials governed by this specification should contact the agency for instructions on samples and information required for testing.
- 3.2 Process Inks: The manufacturer of the sheeting being offered shall furnish at no additional cost the process inks, clears and thinners recommended for the sheeting to meet the performance requirements of this specification, and shall further be responsible for technical assistance in the use of these inks in accordance with Section 8, below.
- 3.3 Slip Sheet: Slip sheet paper, if recommended by the sheeting manufacturer for sheeting surface protection during heat vacuum application or for use in packaging, storing or shipping finished signs, shall be furnished in rolls by the manufacturer at no additional charge, in at least equal square footage and in the same widths as the sheeting supplied.
- 3.4 Temperature Indicators: Expendable temperature indicators, if recommended by the sheeting manufacturer for control and calibration of proper application temperature, shall be furnished by the manufacturer at no additional charge.
- 3.5 Washers: Washers, if recommended by the sheeting manufacturer to protect the sign surface from damage by bolts or other fasteners shall be furnished by the manufacturer at no additional charge.
- 3.6 Prequalification: Sheeting offered to the Agency shall be considered for qualification only when, in the opinion of the engineer, the material is capable of meeting the requirements of this specification; and the sheeting manufacturer provides certified test data showing that representative production material of the type to be supplied has met the requirements for accelerated outdoor weathering in section 6.9 for Types A and B.

OR

The sheeting manufacturer provides documented evidence to the satisfaction of the engineer that representative production material of the type to be supplied has been used successfully in a substantial traffic signing program in similar climatic conditions for at least three years, for Types A and B.

- 3.7 **Handling/Processing Characteristics:** Sheetings which may be used by the Agency in fabricating traffic control signs and objects will be evaluated for handling, screen printing, drying and application properties and compatibility with the agency's equipment and procedures.
- 3.8 **Periodic Evaluation:** Prequalified materials shall meet all requirements of this specification. Failure to do so as shown by periodic evaluation shall be cause for removal of that material from the list of prequalified materials.
- 4.0 **Applicable Documents:** The following documents, of the issues in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.
- 4.1 **ASTM Standards:**
- 4.1.1 B-209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - 4.1.2 E-97 Standard Method for Test for 45-degree 0-degree Directional Reflectance of Opaque Specimens by Filter Photometry.
 - 4.1.3 D523 Standard Method for Test for Specular Gloss.
 - 4.1.4 E-284 Standard Definition of terms Relating to Appearance of Materials.
 - 4.1.5 E-810 Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.
- 5.0 **Test Methods:**
- 5.1 **Test Conditions:** Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of $73 \pm 3^{\circ}$ F ($23 \pm 3^{\circ}$ C) and $50 \pm 5\%$ relative humidity for 24 hours prior to testing.
- 5.2 **Test Panels:** Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective material shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38 or 6061-T6 sheets on 0.020 inch (0.051 cm), 0.040 (0.102 cm) or 0.063 (0.160 cm) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied to the panels in accordance with the recommendations of the retroreflective sheeting manufacturer.
- 6.0 **Requirements:**
- 6.1 **Color Requirements:** Conformance to color requirements shall be determined by instrumental method in accordance with ASTM E97 (geometric characteristics must be confined to: illumination incident within 10 degrees of the centered about a direction of 45 degrees from a perpendicular to the test surface, viewing is within 15 degrees of, and centered about, a perpendicular to the test surface. Conditions of illumination and observation must not be interchanged.) The standards for calibrating the test apparatus shall be the MUNSELL PAPERS designated in Table 24-1. They must recently be calibrated on a spectrophotometer. The test instrument shall be one of the following:
- 1. Gardner Multipurpose reflectometer or Model XL20 AND XL23 Color and Color Difference Meter.
 - 2. Gardner Models AC-2a or XL30 Color Difference Meter.
 - 3. Meeco Model V Colormaster.
 - 4. Hunterlab D25 Color Difference Meter.

Table 24-1
Color Specification Limits* and Reference Standards

Color	X		Y		X		Y		Reflectance Limit (Y)		Munsell		Paper**
	X	Y	X	Y	X	Y	X	Y	Min.	Max.			
White **	.303	.287	.368	.353	.340	.380	.274	.316	27.0				5PB 7/1
Yellow	.498	.412	.557	.442	.479	.520	.438	.472	15.0	40.0			1.25Y 6/12
Red	.613	.297	.708	.292	.636	.364	.558	.352	2.5	11.0			7.5R 3/12
Blue	.144	.030	.244	.202	.190	.247	.066	.208	1.0	10.0			5.8PB 1.32/6.8
Brown	.430	.340	.430	.390	.550	.450	.610	.390	3.0	9.0			5 YR 3/6
Green	.030	.380	.166	.346	.286	.4288	.201	.776	3.0	8.0			10 G 3/8

* The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931, standard colorimetric system measured with standard illumination Source C.

**Silver white is acceptable color designation.

*** Available from Munsell Color Company, 2441 Calvert Street, Baltimore, Maryland 21218. Catalog No. MCP-90040.

Table 24-2
Minimum Coefficient of Retroreflection
(Candelas per Footcandle per Square Foot)

Observation Angle (*)	Entrance Angle (*)	White	Red	Yellow	Green	Blue	Brown
0.2	-4	250	45	170	45	20.0	12.0
0.2	+30	150	25	100	25	11.0	8.5
0.5	-4	95	15	62	15	7.5	5.0
0.5	+30	65	10	45	10	5.0	3.5

- 6.2 **Coefficient of Retroreflection:** The coefficients of retroreflection shall be determined in accordance with ASTM E-810, for the minimum requirements of Table 24-2, as specified.
- 6.2.1 **Units:** Coefficients of retroreflection shall be specified in units of candelas per footcandle per square foot.
- 6.2.2 The observation angles shall be 0.2° and 0.5°.
- 6.2.3 The entrance angles shall be -4° and 30°.
- 6.2.4 For screen printed transparent colored areas on white sheeting, the coefficients of retroreflection shall not be less than 70% of the values for corresponding color in the above table.
- 6.3 **Specular Gloss:** The retroreflective sheeting shall have an 85° specular gloss of not less than 50 when tested in accordance with ASTM-D523.
- 6.4 **Color Processing:** The retroreflective sheeting shall permit cutting and color processing with compatible transparent and opaque process colors in accordance with the sheeting manufacturer's recommendation at temperatures of 60 to 100° F (16 to 38° C) and relative humidity at 20 to 80%. The sheeting shall be heat resistant and permit force curing without staining of applied or unapplied sheeting at temperatures recommended by the sheeting manufacturer.
- 6.5 **Shrinkage:** A 9" x 9" retroreflective sheeting specimen with liner shall be conditioned a minimum of one hour at standard conditions. The liner shall be removed and the specimen placed on a flat surface with the adhesive side up, ten minutes after the liner is removed and again after 24 hours, the specimen shall be measured to determine the amount of

dimensional change. The reflective sheeting shall not shrink in any dimension more than 1/32 inch in 10 minutes nor more than 1/8 inch in 24 hours.

- 6.6 Flexibility: The reflective sheeting with the liner removed and conditioned as in 4.1 shall be sufficiently flexible to show no cracking when slowly bent, in one second's time around a 1/8 inch mandrel with adhesive contacting the mandrel. Talcum powder shall be spread on the adhesive to prevent sticking to the mandrel.
- 6.7 Adhesive: The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solutions without breaking, tearing, or removing any adhesive from the backing. The protective liner shall be easily removed following accelerated storage for four hours at 160° F (71° C) under a weight of 2.5 pounds per square inch.
- 6.8 Impact Resistance: The reflective sheeting, applied according to the sheeting manufacturer's recommendations to a cleaned, etched aluminum panel of alloy 6061 - T6, 0.04" (0.10 cm) by 3" (7.6 cm) by 5" (12.7 cm) and conditioned as in 5.1, shall show no cracking when the face of the panel is subjected to an impact of a 2 inch diameter steel ball (1.19 lbs., 0.54 kg) dropped from a height of 8.5 inches (21.6 cm) through a 2.125 inch (5.4 cm) tube.
- 6.9 Resistance to Accelerated Weathering: The retroreflective surface of the sign shall be weather resistant and show no appreciable cracking, blistering, crazing or dimensional change after two years unprotected outdoor exposure facing the equator and inclined 45° from the vertical. After cleaning, the coefficient of retroreflection shall not be less than 80% of the values in Table 24-2 and the colors shall conform to paragraph 6.9.1.

Following weather exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth, brought to equilibrium at standard conditions tested. The sample shall:

- 6.9.1 Show "good" color fastness or better when tested as in 6.10.
- 6.9.2 Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 1/32 inch (0.08 cm) shrinkage or expansion.
- 6.9.3 Retain not less than 80% of the coefficient of retroreflection values specified in Table 24-2.
- 6.9.4 Not be removable from the aluminum panels without damage.

Retroreflective performance measurements after weather exposure shall be made only at angles of 0.2° observation and -4° entrance. Where more than one panel of a color is measured, the coefficient of retroreflection shall be the average of all the determinations.

- 6.10 Colorfastness: One specimen, exposed and prepared as specified in 6.9 shall be wet out with a mild detergent and water solution and compared with a similarly treated unexposed specimen under natural (North sky) daylight or artificial daylight having a color temperature of 7600° Kelvin. The colorfastness shall be evaluated as follows:

Excellent - no perceptible change in color.
Good - perceptible but no appreciable change in color.
Fair - appreciable change in color.

Appreciable change in color means a change that is immediately noticeable in comparing the exposed specimen with the original comparison specimen. If closer inspection or a change of angle of light is required to make apparent a slight change in color, the change is not appreciable.

- 6.11 Coefficient of Retroreflection During Rainfall:

IMAGE NOT AVAILABLE

Figure 1. Test set up for rainfall test (source and photoreceptor in horizontal plane).

The coefficient of retroreflection of the retroreflective sheeting when totally wet, shall not be less than 90% of the dry values in Table 24-2. Wet performance measurements shall be made on new sheeting in accordance with the standard rainfall test below.

The coefficient of retroreflection under simulated rainfall conditions (wet performance) shall be determined using ASTM E-810 as in 6.2, but with the addition of the water nozzle setup as shown in Figure 1.

Place the test panels on which the sheeting has been applied in an upright position 6 inches below and 4 inches in front of the water nozzle.

Apply sufficient water pressure so that the upper surface of the spray envelope strikes the top of the specimen. With water falling on the specimen, determine the coefficient of retroreflection at angles of 0.2° observation and minus 4° entrance only. Where more than one panel of a color is measured, the coefficient of retroreflection during rainfall shall be the average of all the determinations.

- 6.12 **General Characteristics and Packaging:** The retroreflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks and extraneous materials, and shall be furnished in either rolls or sheets.

When furnished in continuous rolls, the average number of splices shall not be more than three per 50 yards (45.7 m) of material with a maximum of four pieces in any 50-yard (45.7 m) length. Splices shall be butted or overlapped and shall be suitable for continuous application as furnished.

When furnished as cut sheets or sign faces, the sheeting shall be packaged flat in accordance with commercially accepted standards. The sheeting shall be packed snugly in corrugated fiberboard cartons, in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number, color and type adhesive. Stored under normal conditions the retroreflective sheeting as furnished shall be suitable for use a minimum period of one year.

Performance Requirements and Obligations:

- 7.1 **Certification:** The sheeting manufacturer shall submit with each lot or shipment, a certification which states that the material supplied will meet all the requirements listed herein.

7.2 **Field Performance Requirements:**

- 7.2.1 Type A and B sheetings processed and applied to sign blank materials in accordance with sheeting manufacturer's recommendations, shall perform effectively for the number of years stated in Table 24-3 of this specification. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimum specified for that sheeting during that period listed in Table 24-3.

Table 24-3
Minimum Coefficient of Retroreflection
Candelas per Foot Candle per Sq. Ft.
(.2° obs, and -4° entrance)*
Type A and B sheetings

Sheeting Color	Minimum Coefficient	Minimum Coefficient
	of Retro. (7 years)	of Retro. (10 years)
White	212	200
Yellow	144	136
Green	38	36
Red	38	36
Blue	17	16
Brown	10	9

For screen printed transparent colored areas on white sheeting, the coefficients of retroreflection shall not be less than 70% of the values for the corresponding color in the above table.

All measurements shall be made after sign cleaning according to sheeting manufacturer's recommendations.

7.3 Sheeting Manufacturer's Replacement Obligation: Where it can be shown that retroreflective traffic signs with Type A and B sheetings supplied and used according to the sheeting manufacturer's recommendations have not met the performance requirements of Section 7.2, the sheeting manufacturer shall cover restoration costs as follows for sheetings shown to be unsatisfactory during:

7.3.1 The entire ten years: the sheeting manufacturer will replace the sheeting required to restore the sign surface to its original effectiveness.

7.3.2 In addition, during the first seven years: the sheeting manufacturer will cover the cost of restoring the sign surface to its original effectiveness at no cost to the using Agency for materials and labor.

7.4 Government Using Agency Obligation: The using Agency shall be responsible for requiring the dating of all signs at the time of application. That date constitutes the start of the field performance obligation period.

0 Technical Assistance Requirements:

8.1 Instruction and Training: The manufacturer supplying the retroreflective sheeting requirements shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by the Agency. This instruction shall be available on a quarterly basis at no additional cost, and shall include but not be limited to training films, material application, equipment operation, silk screening techniques, packaging, storage and other proven sign shop practices as they apply to the reflective sheeting supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications.

Additional on-site technical assistance by the manufacturer supplying the retroreflective sheeting shall be provided at each of the sign shops designated in the bid invitation. This assistance be provided at least once during each quarter of sign production if required.

8.2 Technical Service: The sheeting manufacturer shall, without additional cost to the Agency, provide the sign shops with competent technical service and product information, including service on screen printing problems with the inks furnished or recommended by the manufacturer for his/her sheeting.

8.3 Equipment: The manufacturer supplying the retroreflective sheeting requirements shall provide service for sheeting application equipment of his manufacturer, certify that trained personnel will be available on 72 hours notice to render such service, and shall stock authorized parts for his/her sheeting application equipment. "Service" is understood to mean the capability of calibration and troubleshooting, as well as the training and retraining of personnel as required.

8.4 Compliance: Failure to comply with the requirements and schedules of 8.1 and 8.2 shall be cause for cancellation of contract.

GROUP 25: SPECIFICATIONS FOR ELECTRONICALLY CUTTABLE FILM FOR USE ON REFLECTIVE SHEETING, TYPE II, TYPE III-A AND DIAMOND GRADE

1.0 Scope: This document covers flexible, transparent and non-transparent, durable films designed to be applied to retroreflective materials for the creation of traffic control signs and devices, and clear transfer tape as specified herein.

2.0 Applicable Documents: The following documents, of the issue in effect on the date of invitation for bids, form a part of this specification to the extent specified herein:

2.1 ASTM Standards

2.2 B 209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.

- 2.3 D 523 Standard Method for Test for Specular Gloss.
- 2.4 D 4956 Standard Specification for Retroreflective Sheeting for Traffic Control.
- 2.5 E 284 Standard Definition of Terms Relating to Appearance of Materials.
- 2.6 E 308 Computing the colors of Objects by Using the CIE System.
- 2.7 E 810 Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.
- 2.8 E 1164 Standard Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation.
- 2.9 CIE Publication Number 39-2, Recommendation for Surface Colors for Visual Signaling.
 - 2.9.1 FP-92 Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects.
- 3.0 **Description:** Electronic cuttable films shall consist of durable, transparent and non-transparent, colored films coated with a transparent pressure sensitive adhesive protected by a clear polyester removable liner. The films are designed to be cut on knife over roll (sprocket fed or friction fed) and flat bed electronic cutting machines. The films shall be available in standard traffic colors, be dimensionally stable, and be designed to optimally cut, weed, lift, and transfer. Use of electronic cuttable films will not require the using agency to release any volatile organic compounds.
- 4.0 **Test Methods:** Test Conditions. Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of 73 ± 3 degrees F (23 ± 1.5 degrees C) and 50 ± 5 degrees relative humidity for 24 hours prior to testing.
- 5.0 **Test Panels:** Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective and/or overlay film(s) shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38, or 6061-T6 sheets on 0.020 inch (0.051 cm), 0.040 inch (0.102 cm), or 0.063 inch (0.160 cm) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied in accordance with the recommendations of the reflective sheeting and electronic cuttable film manufacturer(s).
- 6.0 **Physical Requirements:**
 - 6.1 **Color Requirements:** When electronic cuttable film is applied to retroreflective sheeting, Type II, Type III A and Diamond Grade Sheeting the resulting color of the composite sheeting will conform to Federal Specifications FP-92, Section 718.01 and ASTM D 4956 or to Osceola County specifications for the appropriate retroreflective sheeting to which it is applied.
- 7.0 **Color Test:** Conformance to color requirements shall be determined by instrumental method in accordance with ASTM E 1164 on sheeting applied to aluminum test panels. The values shall be determined on a HunterLab Labscan 6000 0/45 Spectrocolorimeter with CMR 559 [or approved equal 0/45 (45/0) instrument with circumferential viewing (illumination)]. Computations shall be done in accordance with ASTM E 308 for the 2 degrees observer.
- 8.0 **Coefficient of Retroreflection, R_A :** When electronic cuttable film is applied to ASTM Type III (High Intensity) retroreflective sheeting with a hand squeeze roll applicator. The composite will conform to the percentage retained of the minimum coefficient of retroreflective or retroreflective as follows measured in accordance with ASTM E 810:

	Type III Integral R_A Minimum <u>.2 degrees, .4 degrees</u>	EC Film % of R_A Minimum
Yellow	170 cpl	100%
Red	45 cpl	100%
Orange	100 cpl	80%

Blue	20 cpl	80%
Green	45 cpl	80%
Brown	12 cpl	80%
Black	N/A	N/A

For all the retroreflective sheetings used in conjunction with electronic cuttable films, the minimum coefficient of retroreflection for the composite shall be that of a screen-processed sign or not less than 70% of the minimums R_A expressed for colored (integral) sheeting of the same type.

- 8.1 **Units:** Coefficients of retroreflection R_A shall be specified in units of candelas per foot candle per square foot (candelas per lux per square meter).
- 8.2 The observation angles shall be 0.2 and 0.5 degrees unless otherwise specified.
- 8.3 The entrance angles shall be -4 and 30 degrees unless otherwise specified.
- 8.4 Retroreflective sheeting with datum marks shall be tested in the orientation specified by the manufacturer. If no datum mark is supplied, the sheeting shall be rotated to determine the minimum R_A which shall be reported without averaging.
- 8.5 **Specular Gloss:** The electronic cuttable film shall have an 85 degrees specular gloss of not less than 50 when tested in accordance with ASTM D 523.

0 Processing and Cuttability: The electronic cuttable film shall permit cutting, weeding, masking with transfer tape, lifting, and application to retroreflective sheeting when used in accordance with manufacturer's recommendations at temperatures between 65 degrees and 95 degrees F (18.3 degrees and 35.0 degrees C) and relative humidities between 30% and 70%. The film shall lay flat with minimal edge curl and be dimensionally stable.

1.0 Adhesive Liner: The clear polyester protective liner attached to the adhesive shall be removable by peeling without soaking in water or other solutions, without breaking, tearing, or removing any adhesive from the electronic cuttable film. The liner shall have a controlled release from the adhesive coated film sufficient to allow cutting without the film popping off from the liner while still allowing the liner to easily be peeled from the film.

1.0 Resistance to Accelerated Outdoor Weathering: When electronic cuttable film is applied to retroreflective sheeting, the surface of the film shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after 2 years unprotected outdoor exposure, facing the equator and inclined 45 degrees from the vertical. Following weather exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted dry with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall not be less than the value specified by Osceola County for the retroreflective sheeting when the retroreflective sheeting is screen processed.

- 11.1 Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 1/32 inch (0.08 cm) shrinkage or expansion.
- 11.2 Show "good" color fastness or better when tested in 12.0.
- 11.3 The electronic cuttable film shall not be removable from the retroreflective sheeting without damage. Retroreflective performance measurements made after weather exposure shall be made only at angles of 0.2 degrees observation and -4 degrees entrance. Where more than one panel of a color is measured, the coefficient of retroreflection shall be the average of all determinations.

1.0 Colorfastness: One specimen, exposed and prepared as specified in 11.0 shall be wet out with a mild detergent and water solution and compared with a similarly treated unexposed specimen under natural (North sky) daylight or artificial daylight having a color temperature of 7600 degrees K. The colorfastness shall be evaluated as follows:

- Excellent - no perceptible change in color.
- Good - perceptible but no appreciable change in color.
- Fair - appreciable change in color.

Appreciable change in color means a change that is immediately noticeable in comparing the exposed specimen with the original

comparison specimen. If closer inspection or a change of angle of light is required to make apparent a slight change in color, the change is not appreciable.

1.0 **General Characteristics and Packaging:** Roll Goods. When supplied as roll goods, the electronic cuttable film shall be of good appearance, free from ragged edges, cracks and extraneous materials. The maximum number of splices in each roll shall be three per 50 yards of material. Splices shall be butted. The sheeting shall be packaged snugly in corrugated fiberboard cartons, in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number, and color. Stored under normal conditions the electronic cuttable film as furnished shall be suitable for use for a minimum period of one year.

1.0 **Performance Requirements and Obligations:**

14.1 **Certification:** The film manufacturer shall, submit with their bid, a certification which states that the material supplied will meet all of the requirements listed herein.

14.2 **Field Performance Requirements:** The electronic cuttable film applied to retroreflective sheeting, both materials applied in accordance with the manufacturer's recommendations, shall as a composite perform with the same effective performance life as Osceola County specifies for that type of retroreflective sheeting when screen processed. The composite sign will be considered unsatisfactory if it has deteriorated due to normal causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimums specified by Osceola County for the retroreflective sheeting when screen processed.

14.3 The electronic cuttable film shall be fully compatible with the capable of being utilized in conjunction with 3M, Engineer Grade, High Intensity, and Diamond Grade sheeting and further that the effective performance life for these sheetings when utilized with the bidders Electronic Cuttable Film shall be as follows:

Engineer Grade	-	7 Years
High Intensity	-	10 Years
Diamond Grade	-	7 Years

1. **Electronic Film Manufacturer's Replacement Obligation:** Where it can be shown that retroreflective traffic signs with electronic cuttable film supplied and used according to the film manufacturer's recommendations have not met the performance requirements of Section 14.2 and 14.3, the film manufacturer shall cover restoration costs, including full replacement of the composite sign.

1.0 **Government Using Agency Obligation:** The using agency shall be responsible for requiring the dating of all signs at the time of film application. That date constitutes the start of the field performance obligation period.

1.0 **Clear Transfer Tape:** The bidder shall supply clear transfer tape, 3M TPM 5 or equal. This tape shall be capable of satisfactorily transferring the weeded electronically cut film from the backing sheet to the substrate material.

1.0 **Technical Assistance Requirements:**

18.1 **Instruction and Training:** The manufacturer supplying the electronic cuttable film requirement shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by Osceola County. The instruction shall be available on a quarterly basis at no additional cost, and shall include but not be limited to, training films, material application, equipment operation, packaging, storage and other proven sign shop practices as they apply to the electronic cuttable film supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications.

This assistance will be provided at least once each quarter of sign production, upon request by Osceola County:

18.2 **Equipment:** The manufacturer supplying the electronic cuttable film requirement shall provide service for film cutting or application equipment of their manufacture, certify that trained personnel will be available on 72 hours notice to render such service, and shall stock authorized parts for their sheeting application equipment. The manufacturer supplying the electronic cuttable film requirement shall not be required to provide service on film cutting or application equipment not of

- their manufacture.
- 18.3 Compliance: Failure to comply with the requirements and schedules of 8.1 and 8.2 shall be cause for cancellation of contract.
- 18.4 Punched and Non-Punched: Punched and Non-Punched materials shall be compatible with Gerber Sign Maker, Gerber and Zund Plotter/Cutters.

ROUP 26: SPECIFICATION FOR REMOVABLE VEHICLE SHEETING

0 Scope:

- 1.1 This specification covers the requirements for materials and processing of retroreflective, positionable, conformable, removable pressure activated automotive markings including shields, automotive striping and die-cut legends and numbers.
- 1.2 No deviation from this specification shall be made without the formal approval of the purchasing agency. The processor shall certify that all items furnished conform to this specification and will replace or repair without cost all items that fail to meet the requirements of this specification.

0 Performance Characteristics:

2.1 Photometric:

- 2.1.1 Background: The reflective sheeting shall have the following minimum brightness values at .2° observation angle expressed as candlepower per footcandle per square foot (candelas/lux/square meter) of reflective material. Measurements shall be conducted in accordance with testing procedures for Reflective Sheeting, as defined in ASTM E-810.

Entrance Angle	White
-4	70.0
30	30.0

- 2.1.2 The reflective sheeting plus adhesive, shall have a thickness of .006" minimum and .010" maximum.
- 2.1.3 Backing: The adhesive shall be protected by a suitable protective liner easily removed without use of water or other solvents. Protective liner shall not contain any material which might stick to the adhesive and reduce adhesion of film.
- 2.1.4 Adhesive: Film shall have a pressure activated adhesive capable of being applied at temperatures 50°F to 100°F (10°C - 38°C).
- 2.1.4.1 There shall be no effect on the adhesive tack or performance following exposure of the adhesive face under a new General Electric RS Sunlamp for a period of 6 hours at a distance of 8".
- 2.1.4.2 Exterior Exposure: The reflective sheeting shall withstand four (4) years vertical, south facing, unprotected, exterior exposure showing no appreciable deterioration such as cracking, blistering, delamination or loss of adhesion. A slight amount of color fading and chalking is permissible.
- 2.1.5 Conformability: The reflective sheeting shall be sufficiently flexible to permit application, without cracking, to moderately contoured surfaces, such as corrugations and rivets within the temperature range specified by the sheeting supplier.

0 Test Panel Preparation: Test panels shall be prepared using a premasked 12 1/2" x 12 1/2" piece of the reflective sheeting applied with firm squeegee pressure to a clean 12" x 12" aluminum panel, trimmed evenly at the edge of the panel, and aged for 48 hours at 80°F ± 10°. After preparation, the following requirements shall be met:

- 3.1 Initial adhesion shall pass requirements for Class 3 as defined in paragraph 4.3.3 in ASTM D 4956.
- 3.2 The reflective sheeting shall show not more than 1/64" shrinkage in any dimension of the edge of the 12" x 12" aluminum panel after being subjected to a temperature of 150°F for 48 hours.
- 3.3 When subjected to a temperature of -10°F for 24 hours, the reflective sheeting shall resist shocking off the aluminum panel when physically shocked with a spatula.
- 3.4 Fuel Resistance: Markings applied and conditioned as in paragraph 3 shall exhibit no color change, loss of bond, or material degradation after immersion 10 times for 10 seconds into a freshly prepared solution of reference fuel (85% iso-octane, 15% xylol) with a 20 second evaporation period between each dip.
- 3.5 When subjected to a temperature of 150° for 24 hours, the reflective sheeting shall show no delamination or loss of adhesion.

Positionability: The property of a product that enables it to be placed against a substrate surface and easily slid over the surface into proper position without adhering or sticking. Firm pressure to the film is required for permanent adhesion to substrate.

GROUP 27: SPECIFICATIONS FOR DURABLE FLUORESCENT ORANGE WIDE ANGLE PRISMATIC REFLECTIVE SHEETING FOR THE WORK ZONE

1.0 Description: The fluorescent orange wide angle prismatic retroreflective sheeting is specially designed for use on rigid substrate work zone signs to provide high visual impact under nighttime and daytime driving conditions, including low visibility periods such as dawn, dusk, and overcast days. The sheeting shall consist of prismatic lenses formed in a transparent fluorescent orange synthetic resin, sealed, and backed with an aggressive pressure sensitive adhesive protected by a removable liner. The sheeting shall have a smooth surface with a distinctive interlocking diamond seal pattern and orientation marks visible to the face.

2.0 Requirements:

2.1 Photometric - Coefficient of Retroreflection R_A : When the sheeting applied on aluminum test panels is measured in accordance with ASTM E 810, it shall have minimum coefficient of retroreflection values as shown in Table 27-1. The rotation angle shall be 90° , the observation angles shall be 0.2° and 0.5° , the entrance angles (component B1) shall be -4° , $+30^\circ$, and $+50^\circ$, and the entrance angles component B2 = 0° .

TABLE 27-1
Minimum Coefficient of Retroreflection R_A
(Candelas per footcandle per square foot)
(90° Rotation Angle*)

Observation Angle (deg.)	Entrance Angle (deg.)	Orange
0.2	-4	200
0.2	+30	120
0.2	+50	50
0.5	-4	80
0.5	+30	50
0.5	+50	20

* The datum mark (arrow) imprinted on the face of the sheeting shall be the datum mark for test purposes. For the specified 90° rotation angle, the sheeting shall be positioned on the goniometer so that the direction of this datum mark is perpendicular to the observation plane (this geometry is equivalent to a 90° orientation angle with a presentation angle of 0° in the measurement geometry described in Fed. Test Method Standard 370).

- 2.2 Daytime Color: Color shall conform to the requirements of Table 27-2. Daytime color and maximum spectral radiance factor (peak reflectance) of sheeting mounted on aluminum test panels shall be determined instrumentally in accordance with ASTM E 991. The values shall be determined on a HunterLab Labscan 6000 0/45 Spectrocolorimeter with option CMR 559 [or approved equal 0/45 (45/0) instrument with circumferential viewing (illumination)]. Computations shall be done in accordance with ASTM E 308 for the 2° observer.

TABLE 27-2
Color Specification Limits ** (Daytime)

Color	1		2		3		4		Reflectance		Limit Y (%)
	X	Y	X	Y	X	Y	X	Y	Min.	Max.	
Orange (New)	.583	.416	.523	.397	.560	.360	.631	.369	30	-	
Orange (Weathered)	.583	.416	.523	.397	.560	.360	.631	.369	20	45	

**The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illuminant D65.

- 2.3 Nighttime Color: Nighttime color of the sheeting applied to aluminum test panels shall be determined instrumentally in accordance with ASTM E 811 and calculated in the u', v' coordinate system in accordance with ASTM E 308. Sheeting shall be measured at 0.33° observation and -4° entrance at 90° rotation. Color shall conform to the requirements of Table 27-3.

TABLE 27-3
Color Specification Limits ** (Nighttime)

Color	1		2		3		4	
	u'	v'	u'	v'	u'	v'	u'	v'
Orange (new and weathered)	.400	.540	.475	.529	.448	.522	.372	.534

- 2.4 Resistance to Accelerated Weathering: The retroreflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after 1 year's unprotected outdoor exposure in south Florida, south-facing and inclined 45 degrees from the vertical, or after 1500 hours' exposure in a xenon arc weatherometer in accordance with ASTM G 26, Type B, Method A. Following exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall be not less than 100 when measured as in 2.4.2, below, and the color is expected to conform to the requirements of Tables 27-2 and 27-3 for weathered sheeting. The sample shall:
- 2.4.1 Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 1/32 inch (0.08 cm) shrinkage or expansion.
- 2.4.2 Be measured only at angles of 0.2 degrees observation, -4 degrees entrance and 90 degrees rotation. Where more than one panel of a color is measured, the coefficient of retroreflection shall be the average of all determinations.
- 2.5 Impact Resistance: The retroreflective sheeting applied according to the sheeting manufacturer's recommendations to a test panel of alloy 6061-T6, 0.040" (0.10 cm) by 3" (7.6 cm) by 5" (12.7 cm) and conditioned for 24 hrs., shall show no cracking outside the impact area when the face of the panel is subjected to an impact of 100 inch-pounds (11.3 Nm) using a weight with a 5/8 in. (15.8 mm) diameter rounded tip dropped from a height necessary to generate an impact of 100 inch-pounds, at test temperatures of both 32 degrees (0 deg. C) and 72 degrees F (22 deg. C).
- 2.6 Resistance to Heat: The retroreflective sheeting, applied to a test panel as in 2.5, above, and conditioned for 24 hours, shall be measured in accordance with paragraph 2.1 at 0.2° observation and -4° entrance angles at 90°

rotation and exposed to 170 + 5 degrees F (77 + 3 degrees C) for 24 hours in an air circulating oven. After heat exposure the sheeting shall retain a minimum of 70% of the original coefficient of retroreflection.

- 2.7 Field Performance: Retroreflective sheeting processed and applied to sign blank materials in accordance with the sheeting manufacturer's recommendations, is expected to perform effectively for a minimum of 3 years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than 100 when measured at 0.2° observation and -4° entrance at 90° rotation. All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

GROUP 28: SPECIFICATIONS FOR PRISMATIC, RETROREFLECTIVE MARKINGS FOR VEHICLE CONSPICUITY

1.0 Scope:

- 1.1 This specification covers the requirements for materials and processing of prismatic, wide angle, colored retroreflective sheeting designed to enhance both day and night visibility and detection of vehicle.

This highly reflective sheeting shall consist of prismatic lenses formed in a durable transparent resin and backed with an aggressive pressure sensitive adhesive and protective liner.

- 1.2 No deviation from this specification shall be made without the formal approval of Osceola County Purchasing Agent requesting the material. This supplier shall certify that all materials furnished conform to this specification and will replace or repair, without cost, all items that fail to meet requirements of this specification.

2.0 Performance Characteristics:

2.1 Test Conditions:

2.1.1 Test Conditions: Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of 73 ± 5% relative humidity for 24 hours prior to testing.

2.1.2 Test Panels: Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective material shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38 or 6061-T6 sheets in 0.020 inch (0.051 cm), 0.040 (0.102 cm) or 0.0632 (0.160 cm) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied to the panels in accordance with the recommendations of the retroreflective sheeting manufacturer.

- 2.2 Photometrics: The coefficients of retroreflection shall not be less than the minimum values specified in Table 28-1. Measurements are made in accordance with ASTM E-810 "Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting" except that values shall be met at both 0° and 90° orientation without averaging for entrance angles* of -4° and 45°. Values shall be met at 90° orientation only for an entrance angle of 60°. At all entrance angles, values shall be measured at observation angles** of 0.2° and 0.5°. The 90° orientation is defined such that the light source is rotated in the same direction as the sheeting would be applied to the vehicle surface.

* Entrance Angle - the angle formed by a light beam striking a surface at a point and a line perpendicular to the surface at the same point.

** Observation Angle - the angle formed by the light beam striking the reflective surface and the light beam returning to the observer (from 800 ft., a motorist normally views a marking at approximately a 0.2° observation angle).

TABLE 28-1
Minimum Coefficient of Retroreflection
(Candelas per lux per meter squared)
(0 and 90° Orientation)

Observation Angle (°)	Entrance Angle (°)	White	Red
0.2	-4	600	110
0.2	+45	80	30
0.2	+60*	110	22
0.5	-4	280	50
0.5	+45	80	15
0.5	+60*	30	6

* The 60° entrance angle shall be measured such that the light source is rotated in the same direction as the sheeting would be applied to the vehicle surface.

- 2.3 Color: White will appear as a solid color. Red will appear in an alternating block pattern of 11 inches red and 7 inches white. Conformance to color requirements shall be determined by instrumental method in accordance with ASTM E-1164 on sheeting applied to test panels and conditioned as specified under 1.0. The values shall be determined on a Hunter Lab Labscan II 0/45 Spectrocolorimeter with option CMR 559. Computations shall be done in accordance with E-308.

TABLE 28-2
Color Specification Limits* (Daytime)

Color	1		2		3		4		Reflectance Limit Y (%)	
	X	Y	X	Y	X	Y	X	Y	Min.	Max.
White	0.305	0.305	0.355	0.355	0.335	0.375	0.285	0.325	40	-
Red	0.690	0.310	0.595	0.315	0.569	0.341	0.655	0.345	3	15

* The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standards colorimetric system measured with standard illuminant D65.

- 2.4 Impact Resistance: The retroreflective sheeting applied according to the sheeting manufacturer's recommendations to a test panel of alloy 6061-T6, 0.040" (0.10 cm) by 3" (7.6 cm) by 5" (12.7 cm) and conditioned as in 1.0, shall show no cracking outside the impact area when the face of the panel is subjected to an impact of 10 inch-pounds (1.13 Nm), using a weight with a 5/8 inch (15.8 mm) diameter rounded tip dropped from a height necessary to generate an impact of 10 inch-pounds, at test temperatures of both 32°F (0°C) and 72°F (22°C).
- 2.5 Resistance to Accelerated Outdoor Weathering: The retroreflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing or dimensional change after 2 years unprotected outdoor exposure, facing the equator in South Florida and incline 45° from the vertical. Following weathering exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall not be less than the values in Table 28-3 when measured per Section 2 and the color shall conform to the requirements of Table 28-2 paragraph 3.0. The sample shall:
- 2.5.1 Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 1/32 inch (0.08 cm) shrinkage or expansion.
- 2.5.2 Be measured only at angles of 0.2° observation, -4° entrance. Where more than one panel of a color is measured, the coefficient of retroreflection shall be the average of all determinations.

TABLE 28-3
Minimum Coefficient of Retroreflection R
after Accelerated Outdoor Weathering
(candelas per lux per meter squared)

Color	Observation Angle (°)	Entrance Angle (°)	cd/lx/m ²
White	0.2	-4	300
Red	0.2	-4	55

- 2.6 Resistance to Heat: The retroreflective sheeting, applied to a test panel and conditioned as in 1.0, shall be measured in accordance with paragraph 2.2 at 0.2° observation and -4° entrance angles at both 0° and 90° orientations and exposed to 170 ± 5°F (77 ± 3°C) for 24 hours in an air circulating oven. After heat exposure the sheeting shall retain a minimum of 70% of the original coefficient of retroreflection at both orientations when measured at room temperature.
- 2.7 Resistance to Corrosion: The retroreflective sheeting applied to a test panel and conditioned as in 1.1, shall show no loss of adhesion, appreciable discoloration or corrosion and after cleaning shall retain a minimum of 80% of the original coefficient of retroreflection when measured as described in paragraph 2.0 after 1000 hours of exposure to a 5% concentration salt spray at 95°F (35°C) when tested in accordance with ASTM B-117.

2004
Matched Component System Order Form
Fax to 1-800-591-9293

700 Series		Gallons
705	Black (Opaque)	
707	Toner	
708	Green	
710	Blue	
711	Thinner	
712	Traffic Sign Red	
714	Yellow	
716	Construction Orange	
717	Brown	

880I Series		Gallons
882I	Traffic Sign Red	
883I	Blue	
884I	Yellow	
885I	Black (Opaque)	
886I	Orange	
887I	Brown	
888I	Green	
891I	Thinner	
892I	Flow Additive	

990 Series for 3290		Gallons
990-00	Toner	
990-03	Blue	
990-04	Yellow	
990-05	Black (Opaque)	
990-06	Orange	
990-07	Brown	
990-08	Green	
990-12	Traffic Sign Red	
991	Thinner	

1800 Series		Gallon
1805	Black	
CGS-50	Thinner	

Note: See TSS Price Catalog for all other premix colors or special formulations.
 Contact TSS Customer Service for more information at 1-800-553-1380

<u>Slip Shtg.</u>	SCW568 For packaging of finished signs made of 3M™ "Diamond Grade" & High Intensity Grade Sheeting only.
	150 yds
24" Rolls	
30" Rolls	
36" Rolls	
48" Rolls	

By my signature (below) I accept that these items are provided to me free of charge for purposes of application to or use with 3M™ Reflective Sheatings only. They may not be used with other sheatings and may not be resold.

Date: _____

Company/Agency Name: _____

Address: _____

Telephone: _____

Authorized Customer (Please Print): _____

Signature: _____

3M Atlanta Sales Center

2860 Bankers Industrial Drive
Atlanta, GA 30360-2764
770 447 7000

April 4, 2005



Mr. Earl Pflaumer, CPPB
Lee County Purchasing Division
P.O. Box 398
Ft. Myers, FL 33902-0398

05 APR 12 AM 8:47

Dear Earl,

As you know, The Florida Department of Transportation (FDOT), Department of Management Services (DMS) contract (#550-590-01-1), expired on 2/28/05. This is the contract under which most of your 3M TSS Division purchases were made. The FDOT plans to re-bid the contract, however, they say it will take a few months to get it done.

Until such time as the new contract is in place, you can order most materials you purchase from me "piggy backing" off the Osceola County, Florida contract (copy enclosed) that was awarded to 3M for one year, effective 2/21/05. On page 6, paragraph B25 you will find the language that references other government agencies access to this bid award.

Listed below, for easy reference, are the page and group numbers for the 3M products you can order from this contract.

Page 14, Group 14 & 15

Stamark™ E-44 and P-50 Pavement Marking Adhesive @ \$140.85 (5 gal.)

Page 15, Group 17.1

Stamark™ 6330 Durable Pavement Marking Tape with liner. 30 yard rolls in various widths. See page for pricing.

Page 16, Group 18.1 & 18.2

3983/3963 Series, VIP/LDP Fluorescent Yellow Green Diamond Grade™. 50 yard rolls in all widths @ \$4.90 per square foot.

Page 16, Group 19.1 & 19.2

3990/3970 Series, VIP/LDP Diamond Grade™ in all colors and roll widths @ \$4.25 per square foot.

Page 16, Group 20.1

3200 Series, Engineer Grade in all colors and roll widths @ \$.75 per square foot

Page 17, Group 22

A750/751 White and Yellow Removable Wet Reflective Pavement Marking Tape @ \$2.97 per square foot

Page 17 & 18, Group 23

High Intensity Work Zone Sheeting. See pages for pricing.

Page 18, Group 24.1 & 24.2

3800 Series High Intensity in all colors and roll widths \$1.49 per square foot

3800 Series Punched High Intensity in all colors and roll widths @ \$1.59 per square foot

Page 18, Group 25

1170 Series ECFilm in all colors and roll widths @ \$1.15 per square foot

Page 19, Group 26

680CR Durable, Flexible, Removable Reflective Sheeting for Vehicle Markings in all colors & roll widths @ \$2.5812 per square foot

Page 19, Group 27

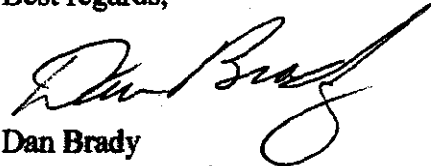
3924 Diamond Grade™ Work Zone Reflective Sheeting in all roll widths @ \$3.50 per square foot

Page 19, Group 28

3983-32 Diamond Grade™ Red/White Conspicuity rolls. See page for pricing.

Our Customer Service Department has set-up Osceola County's pricing for use by all local government agencies in Florida. If you have any questions about this contract or the pricing of items awarded, please call me. My cell phone number is 954/263-1378.

Best regards,



Dan Brady
Account Executive

3M Traffic Safety Systems Division

ATTACHMENT # 4

March 1, 2005

FAX#888-246-9793

3M Company
Attn: Dennis J. Johnson
3M Center, Building 225-5S-08
P.O. Box 33225
St. Paul, MN 55133-3225

RE: Award of Bid A/R#05-412-TM, Sign Materials
Primary Groups 14, 15, 17-28

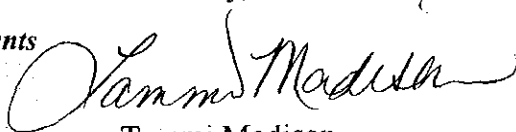
Dear Mr. Johnson,

Congratulations! The Osceola Board of County Commissioners approved the award of the above referenced bid on February 21, 2005. This award will be in effect through February 21, 2006.

As a reminder, a purchase order **must be received** prior to starting any work under this contract. If you do not receive a purchase order, please contact me at the number listed below.

Please feel free to contact me with any questions you may have regarding this contract at (407) 343-3132. Thank you.

Sincerely,



Tammi Madison
Buyer

cc: file

Osceola
County

1 Courthouse Square
Suite 2300
Kissimmee, Florida 34741
(407) 343-3125
(407) 343-3130 Fax

**FINANCIAL
SERVICES
DEPARTMENT**

Thomas P. Klinker
Director
407/343-2700

Budget
407/343-3017

Finance
Accounts Payable
Accounts Receivable
Payroll
407/343-2700

Grants
407/343-3178

Procurement
407/343-3125

Special Assessments
407/343-3185

ATTACHMENT #5

Bid No. A/R#05-412-TM	Due Date: December 28, 2005 @ 2:00 p.m.	Advertised Date: December 5, 2004
Buyer: Tammi Madison tmad@osceola.org	Respond to: Procurement Services, 1 Courthouse Sq., Suite 2300, Kissimmee, FL 34741 Phone: 407-343-3142 Fax: 407-343-3130	
Bid Title: Sign Materials & Road Markings		

Invitation for Bid

THIS IS NOT AN ORDER

Bid Title: Sign Materials & Road Markings	
Bid Number: Annual Requirement (A/R)#05-412-TM	
Requesting Department: Road & Bridge	
Bid Due Date: December 28, 2004	Bid Time Due: 2 PM Local Time
Location to Deliver Bid: Procurement Services, 1 Courthouse Square, Suite 2300 Kissimmee, Florida 34741	

In accordance with the intent and content of this Invitation for Bid (IFB), we the undersigned do hereby offer to perform as stipulated in this response. Failure to do so may result in the forfeiting of bid security, removal from the County's bidder list, or other remedies available to the County under the laws of the State of Florida.

Legal Name of Bidder: 3M Company		
Business Address: 3M Center, Bldg. 225-5S-08, PO Box 33225 St. Paul, MN 55133-3225		
Phone Number 800-553-1380	Fax Number 888-246-9793	E-Mail Address tbidgroup@mnm.com
Osceola County Occupational License Number: See enclosed letter		
Contractor's Florida License Number (as applicable): 41-0417775		
Authorized Signature (manual):		Date: 12-23-04
Printed Signature Dennis J. Johnson		Title: Contract Specialist

General Instructions/Declarations

- Bids will be opened and publicly read aloud by a representative of the Purchasing Department in the Purchasing Conference Room (1 Courthouse Square, Suite 2300, Kissimmee, FL) on the appropriate date and time as shown above. All bid openings are open to the public. Interested parties are welcomed to attend the bid openings.
- Bids must be SUBMITTED ON THE FORM FURNISHED BY THE COUNTY and in accordance with specifications and list of quantities desired.
- This completed page must appear as the top sheet of your bid response.
- It is the intent and purpose of Osceola County that this Invitation for Bid promotes competitive bidding. It shall be the bidder's responsibility to advise the Purchasing Department at the address noted above, if any language, requirements, etc., or any combination thereof, inadvertently restricts or limits the requirements stated in this invitation for Bid to a single source. Such notification must be submitted in writing and must be received by the Purchasing Department not later than ten (10) days prior to the bid closing date.

Bid No. AVR#05-412-TM	Due Date: December 28, 2005 @ 2:00 p.m.	Advised Date: December 5, 2004
Buyer: Tammi Madison tmad@osceola.org	Respond to: Procurement Services, 1 Courthouse Sq., Suite 2300, Kissimmee, FL 34741 Phone: 407-343-3142 Fax: 407-343-3130.	
Bid Title: Sign Materials & Road Markings		

*Tensile strength - 2000 P.S.I.				
*Elongation - 200 P.S.I.				
*Tear strength - 300 P.S.I.				
*Heat resistance - No slump after 8 hrs.				

11.	Type II Barricades: Shall conform to the <u>Manual on Uniform Traffic Control Devices</u> , material and dimensions shall be as follows: *Height - 45" *Panel width - 12" *Panel color - White *Panel thickness - Min. 1/2" *Panel length - 36" *Reflective sheeting - Type IIIA or IIIC	N/A	300	\$ NO BID	\$ _____
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12.	Barricade Warning Lights: Shall meet all of the requirements of the <u>Manual on Uniform Traffic Control Devices</u> and I.T.E. specifications.				
GBUP#	DESCRIPTION	SIZE	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED PRICE
12.1	Type A and C combination with 3 way (flashing, steadyburn and off) modes; 12 volts with photo cell	N/A	300	\$ NO BID	\$ _____
12.2	Type B (12 volt) without photo cell	N/A	75	\$ NO BID	\$ _____
TOTAL BID FOR GROUP 12 (extended prices):				\$ NO BID	\$ _____

13.	Delineator Post: Post shall be flanged Channel type; steel, 3/8" holes drilled on one inch (1") centers, beginning one inch (1") from top of post for the full length of post. Post shall have a hot-dipped galvanized coating conforming to ASTM specification A123.	7'	500	\$ NO BID	\$ _____
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14.	Stamark brand contact cement #E-44 or equivalent	5 gallon containers	6 containers	\$ 140.85	\$ 845.10
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15.	Stamark brand R046 or equivalent P50	5 gallon containers	8 containers	\$ 140.85	\$ 1126.80
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16.	Abrasion Resistant Sun Country, Prismatic Reflective Pavement Marker (Stimsonite Model 811, Aor equal@):				
GROUP #	Product #	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED PRICE
16.1	Product # RPM-290-2W RPM-290-2R	Reflective raised pavement marker, one color bi-directional reflectorized faces - white, red and yellow RPM-291-2Y	10,000	\$.95	\$ 9500.00
16.2	Product # RPM-295-2B	Reflective raised pavement marker, one color bi-directional reflectorized faces - blue	200	\$ 1.25	\$ 250.00
16.3	Product # RPM-290-WR RPM-290-WY	Reflective raised pavement marker, two color bi-directional reflectorized faces - any combination of white, red, yellow RPM-291-YR	5,000	\$.95	\$ 4750.00
16.4	Product # RPM-290-W RPM-290-R	Reflective raised pavement marker, mono-directional reflectorized face - white, red and yellow RPM-291-Y	10,000	\$.90	\$ 9000.00
TOTAL BID FOR GROUP 16 (extended prices): Mfg./Brand Name: 3M Company/3M			\$ 23,500.00		

Bid No. A/R#05-412-TM	Due Date: December 28, 2005 @ 2:00 p.m.	Advertised Date: December 5, 2004
Buyer: Tammi Madison tmad@osceola.org	Respond to: Procurement Services, 1 Courthouse Sq., Suite 2300, Kissimmee, FL 34741 Phone: 407-343-3142 Fax: 407-343-3130	
Bid Title: Sign Materials & Road Markings		

17. Durable Primerless Retroreflective Preformed Pavement Markings:					
GROUP #	Product #	DESCRIPTION	Estimated Quantity	UNIT PRICE	EXTENDED PRICE
17.1	Product # 6330 White Only not available in yellow	Highly durable reflective preformed pavement markings, with a pressure-sensitive adhesive (with liner) - white or yellow tape: 4" x 30 yds. 6" x 30 yds. 8" x 30 yds. 12" x 30 yds. 16" x 30 yds. 24" x 30 yds.	6 rolls 6 rolls 5 rolls 5 rolls 5 rolls 5 rolls	\$ 58.50 \$ 87.75 \$ 117.00 \$ 175.50 \$ 234.00 \$ 351.00	\$ 351.00 \$ 526.50 \$ 585.00 \$ 877.50 \$ 1170.00 \$ 1755.00
17.2	Product #	Highly durable reflective preformed (handicap) pavement marking symbol, constructed in one piece of a solid blue and white polymer based material with a pressure-sensitive adhesive protected by a removable liner. 30" x 36" 48" x 52"	10 15	\$ No Bid \$ No Bid	\$ \$
TOTAL BID FOR GROUP 17 (extended prices): Mfg./Brand Name: 3M Company/Stamark				\$	5265.00

18.	Fluorescent Wide Angle Prismatic Retroreflective Sheeting (2 types) (A or equal@):
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Bid Title: Sign Materials & Road Markings		

18.1	Product # 3983	Reflective sheeting, prismatic (type A), with pressure-sensitive adhesive backing - fluorescent yellow and green: 12" x 50 yds. 24" x 50 yds. 36" x 50 yds. 48" x 50 yds. Custom length/width (other than sizes listed above) *	4 rolls 4 rolls 5 rolls 5 rolls per sq ft	\$ 735.00 \$ 1470.00 \$ 2205.00 \$ 2940.00 \$ 4.90	\$ 2940.00 \$ 5880.00 \$ 11,025.00 \$ 14,700.00 N/A
18.2	Product # 3963	Reflective sheeting, prismatic (type B), with pressure-sensitive adhesive backing - fluorescent yellow and green: 12" x 50 yds. 24" x 50 yds. 36" x 50 yds. 48" x 50 yds. (36" is the widest for 3963) Custom length/width (other than sizes listed above) *	2 rolls 2 rolls 2 rolls 2 rolls per sq ft	\$ 735.00 \$ 1470.00 \$ 2205.00 \$ N/A \$ 4.90	\$ 1470.00 \$ 2940.00 \$ 4410.00 \$ N/A N/A
TOTAL BID FOR GROUP 18 Mfg./Brand Name: 3M Company/3M				\$ 43,365.00	

19.	Type III-D Wide Angle Prismatic Retroreflective Sheeting (Aor equal@):				
19.1	Product # 3990 White 3991 Yellow 3992 Red 3995 Blue 3997 Green	Reflective sheeting, prismatic (type A), with pressure-sensitive adhesive backing - white, red, green, blue, yellow: 5" x 50 yds. 9" x 50 yds. 12" x 50 yds. 18" x 50 yds. 24" x 50 yds. 30" x 50 yds. 36" x 50 yds. 48" x 50 yds. Custom length/width (other than sizes listed above) *	5 rolls 10 rolls 5 rolls 5 rolls 5 rolls 10 rolls 5 rolls 5 rolls per sq ft	\$ 265.62 \$ 478.12 \$ 637.50 \$ 956.25 \$ 1275.00 \$ 1593.75 \$ 1912.50 \$ 2550.00 \$ 4.25	\$ 1328.10 \$ 4781.20 \$ 3187.50 \$ 4781.25 \$ 6375.00 \$ 15,937.50 \$ 9562.50 \$ 12,750.00 N/A
19.2	Product # 3970 White 3971 Yellow 3972 Red 3975 Blue 3977 Green	Reflective sheeting, prismatic (type B), with pressure-sensitive adhesive backing - white, red, green, blue, yellow: 12" x 50 yds. 18" x 50 yds. 24" x 50 yds. 30" x 50 yds. 36" x 50 yds. 48" x 50 yds. (36" is the widest for 3970 Series) Custom length/width (other than sizes listed above) *	2 rolls 2 rolls 2 rolls 2 rolls 5 rolls 5 rolls per sq ft	\$ 652.50 \$ 978.75 \$ 1305.00 \$ 1631.25 \$ 1957.50 \$ N/A \$ 4.35	\$ 1305.00 \$ 1957.50 \$ 2610.00 \$ 3262.50 \$ 9787.50 \$ N/A N/A
TOTAL BID FOR GROUP 19 Mfg./Brand Name: 3M Company/3M				\$ 77,625.55	
20.	Type II Enclosed Lens Retroreflective Sheeting:				
20.1	Product # 3290 White 3271 Yellow 3272 Red 3275 Blue 3277 Green 3279 Brown	Engineering grade reflective sheeting which consists of enclosed spherical lens elements embedded within a transparent plastic having a smooth flat outer surface and a pressure-sensitive adhesive backing - red, yellow, blue, green, white, brown: 12" x 50 yds. 18" x 50 yds. 24" x 50 yds. 30" x 50 yds. 36" x 50 yds. 48" x 50 yds. Custom lengths (other than listed above) *	6 rolls 6 rolls 6 rolls 2 rolls 2 rolls 2 rolls per sq ft	\$ 112.50 \$ 168.75 \$ 225.00 \$ 281.25 \$ 337.50 \$ 450.00 \$.75	\$ 675.00 \$ 1012.50 \$ 1350.00 \$ 562.50 \$ 675.00 \$ 900.00 N/A

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Bid Title: Sign Materials & Road Markings		

TOTAL BID FOR GROUP 20 (extended prices): Mfg./Brand Name:	\$ 5,175.00
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21.	Retroreflective Preformed Pavement Marking Material for Construction Work Zones:				
Product #	Metallic backed reflective preformed pavement markings, with a pressure-sensitive adhesive (without liner) - white or yellow tape: 4" x 100 yds. 6" x 100 yds. Custom length/width (other than sizes listed above)	10 rolls 40 rolls per sq ft	\$ No Bid \$ No Bid \$ No Bid	\$ \$ N/A	

TOTAL BID FOR GROUP 21 (extended prices): Mfg./Brand Name:	\$
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22.	Removable Retroreflective Preformed Pavement Marking Material for Construction Work Zones:				
Product #	Removable reflective preformed pavement markings, with a pressure-sensitive adhesive (without liner) - white or yellow tape: A750 White 4" x 50 yds. A751 Yellow 6" x 50 yds. Custom length/width (other than sizes listed above) *	10 rolls 40 rolls per sq ft	\$148.50 \$222.75 \$2.97	\$1485.00 \$8910.00 N/A	

TOTAL BID FOR GROUP 22 (extended prices): Mfg./Brand Name: 3M Company/Stamark	\$ 10,395.00
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23.	Type IV Retroreflective Sheeting for the Work Zone:				
23.1	Product #	High performance reflective sheeting (type A), for use on reboundable plastic substrate work zone traffic control devices, with pressure-sensitive adhesive backing - white, yellow, orange: 3810 White 3" x 50 yds. 3811 Yellow 4" x 50 yds. 3814 Orange 6" x 50 yds. 8" x 50 yds. 10" x 50 yds. 12" x 50 yds. Custom lengths (other than listed above) *	5 rolls 5 rolls 5 rolls 5 rolls 5 rolls 5 rolls per sq ft	\$148.12 \$197.50 \$296.25 \$395.00 \$493.75 \$592.50 \$3.95	\$740.60 \$987.50 \$1481.25 \$1975.00 \$2468.75 \$2962.50 N/A

23.2	Product #	High performance reflective sheeting (type B), prestriped barricade sheeting with pressure sensitive adhesive backing - 4" or 6" orange and white stripes, right or left: 314 L/R 6" x 50 yds. 316 L/R 8" x 50 yds. 12" x 50 yds. Custom lengths (other than listed above) *	2 rolls 5 rolls 5 rolls per sq ft	\$111.75 \$149.00 \$223.50 \$1.49	\$223.50 \$745.00 \$1117.50 N/A
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23.3	Product #	High performance reflective sheeting (B), for use on rigid substrate work zone safety devices, with pressure-sensitive adhesive backing - white, yellow, orange: 3820 White 4" x 50 yds. 3821 Yellow 6" x 50 yds. 3824 Orange 18" x 50 yds. 24" x 50 yds. 30" x 50 yds. 36" x 50 yds. 48" x 50 yds. Custom lengths (other than listed above) *	5 rolls 5 rolls 5 rolls 5 rolls 5 rolls 5 rolls 5 rolls per sq ft	\$74.50 \$111.75 \$335.25 \$447.00 \$558.75 \$670.50 \$894.00 \$1.49	\$372.50 \$558.75 \$1676.25 \$2235.00 \$2793.75 \$3352.50 \$4470.00 N/A
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23.4	Product #	High performance reflective sheeting (C), for use on PVC traffic cones,			
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Bid Title: Sign Materials & Road Markings		

3840 4C	with pressure-sensitive adhesive backing - white 4" and 6" bands (100 per package: 4" - inch band 6" - inch band	2 pkgs.	\$ 244.80	\$ 489.60
3840 6C		2 pkgs.	\$ 236.70	\$ 473.40

TOTAL BID FOR GROUP 23 (extended prices):
Mfg./Brand Name: 3M Company/3M

\$ 29,123.35

24.	Type III-A or III-C Retroreflective Sheeting:				
24.1	Product #	High performance, reflective sheeting (type A), with pressure-sensitive adhesive backing - white, red, green, blue, yellow, brown: 3" x 50 yds. 6" x 50 yds. 9" x 50 yds. 12" x 50 yds. 18" x 50 yds. 24" x 50 yds. 30" x 50 yds. 36" x 50 yds. 48" x 50 yds. Custom lengths (other than listed above) *			
	3870 White		8 rolls	\$ 55.88	\$447.04
	3871 Yellow		10 rolls	\$ 111.75	\$1117.50
	3872 Red		25 rolls	\$ 167.62	\$4190.50
	3875 Blue		8 rolls	\$ 223.50	\$1788.00
	3877 Green		8 rolls	\$ 335.25	\$2682.00
	3879 Brown		10 rolls	\$ 447.00	\$4470.00
			8 rolls	\$ 558.75	\$4470.00
			6 rolls	\$ 670.00	\$4020.00
			8 rolls	\$ 894.00	\$7152.00
				\$	
			per sq ft	1.49	N/A
24.2	Product #	High performance, reflective sheeting (type B), with pressure sensitive adhesive backing, perforated for use in electronic cutting machines - white, red, green, blue, yellow, brown: 15" x 50 yds. 30" x 50 yds. Custom lengths (other than listed above) *			
	3860S White (only available in white)		15 rolls	\$ 298.12	\$ 4471.80
			10 rolls	\$ 596.25	\$ 5962.50
				\$	N/A
			per sq ft	1.59	

TOTAL BID FOR GROUP 24 (extended prices):
Mfg./Brand Name: 3M Company/3M

\$ 40,771.34

25.	Electronically Cuttable Film for Use on Reflective Sheeting, Type II, Type III-A and Diamond Grade:				
25.1	Product #	Electronic cuttable films, with pressure-sensitive adhesive backing, perforated for use in a Gerber (sprocket fed) electronic cutting machines: 15" x 50 yds., green 15" x 50 yds., red 15" x 50 yds., blue 15" x 50 yds., yellow 15" x 50 yds., orange 15" x 50 yds., brown 15" x 50 yds., black Custom lengths (other than listed above) *			
	1177		2 rolls	\$ 215.62	\$ 431.24
	1172		2 rolls	\$ 215.62	\$ 431.24
	1175		2 rolls	\$ 215.62	\$ 431.24
	1171		2 rolls	\$ 215.62	\$ 431.24
	1174		2 rolls	\$ 215.62	\$ 431.24
	1179		2 rolls	\$ 215.62	\$ 431.24
	1178		2 rolls	\$ 215.62	\$ 431.24
			5 rolls	\$ 215.62	\$ 1078.10
			per sq ft	\$ 1.15	N/A
	1177	30" x 50 yds., green	2 rolls	\$ 431.25	\$ 862.50
	1172	30" x 50 yds., red	2 rolls	\$ 431.25	\$ 862.50
	1171	30" x 50 yds., yellow	2 rolls	\$ 431.25	\$ 862.50
	1175	30" x 50 yds., blue	2 rolls	\$ 431.25	\$ 862.50
	1174	30" x 50 yds., orange	2 rolls	\$ 431.25	\$ 862.50
	1179	30" x 50 yds., brown	2 rolls	\$ 431.25	\$ 862.50
	1178	30" x 50 yds., black	2 rolls	\$ 431.25	\$ 862.50
			5 rolls	\$ 431.25	\$ 2156.25
			per sq ft	\$ 1.15	N/A
25.2	Product #	Electronic cuttable films, with pressure-sensitive adhesive backing, non-perforated for use in electronic cutting machines:			
	1177	48" x 50 yds., green	10 rolls	\$ 690.00	\$ 6900.00
	1172	48" x 50 yds., red	5 rolls	\$ 690.00	\$ 3450.00
	1175	48" x 50 yds., blue	2 rolls	\$ 690.00	\$ 1380.00
	1171	48" x 50 yds., yellow	2 rolls	\$ 690.00	\$ 1380.00
	1174	48" x 50 yds., orange	5 rolls	\$ 690.00	\$ 3450.00
	1179	48" x 50 yds., brown	2 rolls	\$ 690.00	\$ 1380.00

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1178	48" x 50 yds., black Custom lengths (other than listed above)	10 rolls per sq ft	\$ 690.00 \$ 1.15	\$ 6900.00 N/A
TOTAL BID FOR GROUP 25 (extended prices): Mfg./Brand Name: 3M Company/3M			\$ 35,836.79	

26.	Removable Vehicle Sheeting:			
Product #	Highly durable flexible, <u>removable</u> , enclosed lens reflective sheeting with controltac adhesive designed for the production of multicolor vehicle markings - gold, yellow, light blue, lemon yellow, ruby red and black: 24" x 50 yds. 48" x 50 yds. Custom length/width (other than sizes listed above) *			
680CR-64 Gold		4 rolls	\$ 774.36	\$ 3097.44
680CR-71 Yellow		4 rolls	\$ 1548.72	\$ 6194.88
680CR-76 Lt. Blue		per sq ft	\$ 2.5812	N/A
680CR-81 Lemon Yellow				
680CR-82 Ruby Red				
680CR-85 Black				
TOTAL BID FOR GROUP 26 (extended prices): Mfg./Brand Name: 3M Company/3M			\$ 9292.32	

27.	Durable Fluorescent Orange Prismatic Reflective Sheeting for the Work Zone:			
Product #	Reflective sheeting, prismatic type, with pressure-sensitive adhesive backing - fluorescent orange: 12" x 50 yds. 24" x 50 yds. 36" x 50 yds. 48" x 50 yds. Custom length/width (other than sizes listed above) *			
3924		2 rolls	\$ 525.00	\$ 1050.00
		4 rolls	\$ 1050.00	\$ 4200.00
		5 rolls	\$ 1575.00	\$ 7875.00
		5 rolls	\$ 2100.00	\$ ±0,500.00
		per sq ft	\$ 3.50	N/A
TOTAL BID FOR GROUP 27 (extended prices): Mfg./Brand Name: 3M Company/3M			\$ 23,625.00	

28.	Prismatic, Retroreflective Markings for Vehicle Conspicuity:			
Product #	Highly reflective prismatic lens sheeting with pressure-sensitive adhesive designed for truck and trailer markings - red/white: 2" x 50 yds. 3" x 50 yds. 4" x 50 yds.			
983-32		5 rolls	\$ 80.00	\$ 400.00
		5 rolls	\$ 120.00	\$ 600.00
		5 rolls	\$ 160.00	\$ 800.00
TOTAL BID FOR GROUP 28 (extended prices): Mfg./Brand Name: 3M Company/3M			\$ 1800.00	

F2. THE FINAL BID SCHEDULE (extended prices):

Total number of groups bid: 14

Total Bid Price for Group 1	\$ No Bid
Total Bid Price for Group 2	\$ No Bid
Total Bid Price for Group 3	\$ No Bid
Total Bid Price for Group 4	\$ No Bid
Total Bid Price for Group 5	\$ No Bid
Total Bid Price for Group 6	\$ No Bid
Total Bid Price for Group 7	\$ No Bid
Total Bid Price for Group 8	\$ No Bid
Total Bid Price for Group 9	\$ No Bid

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Total Bid Price for Group 10	\$ No Bid
Total Bid Price for Group 11	\$ No Bid
Total Bid Price for Group 12	\$ No Bid
Total Bid Price for Group 13	\$ No Bid
Total Bid Price for Group 14	\$ 845.10
Total Bid Price for Group 15	\$ 1126.80
Total Bid Price for Group 16	\$ 23,500.00
Total Bid Price for Group 17	\$ 5265.00
Total Bid Price for Group 18	\$ 43,365.00
Total Bid Price for Group 19	\$ 77,625.55
Total Bid Price for Group 20	\$ 5175.00
Total Bid Price for Group 21	\$ No Bid
Total Bid Price for Group 22	\$ 10,395.00
Total Bid Price for Group 23	\$ 29,123.35
Total Bid Price for Group 24	\$ 40,771.34
Total Bid Price for Group 25	\$ 35,836.79
Total Bid Price for Group 26	\$ 9292.32
Total Bid Price for Group 27	\$ 23,625.00
Total Bid Price for Group 28	\$ 1800.00

NET BID PRICE: \$ 307,746.25

If bidder is not the successful bidder as Prime Supplier, will bidder be willing to serve in a Secondary Supplier@ capacity under the same terms and conditions contained herein? yes, no.

To the Purchasing Director: By my signature below I/We the undersigned certify that this Bid is genuine, not collusive or made in behalf of another person, firm or corporation not named herein and that the undersigned has not directly or indirectly induced or solicited any other bidder to submit a sham bid or any other person, firm or corporation to refrain from bidding and that the undersigned has not in any manner sought collusion to secure himself an advantage over any other bidder. By submittal of this bid the undersigned agrees to abide by all terms and conditions set forth herein including but not limited to the specifications, bid security, prompt contracting and timely delivery of the services and/or equipment to be procured hereby.

Prompt Payment Discount: 0 % Days
Discount for prompt payment of 30 days or longer may be considered in Evaluation of Award.

Signature of Authorized Representative:

Date: 12-23-04

Printed Name: Dennis J. Johnson

Title: Contract Specialist

ACKNOWLEDGMENT IS HEREBY MADE OF RECEIPT OF ADDENDA ISSUED DURING THE SOLICITATION PERIOD:

ADDENDUM # _____ THROUGH ADDENDUM # _____

* Custom length rolls priced by special quotation only.
Please contact St. Paul at 1-800-553-1380 Prompt 2.

**ATTACHMENT C
DRUG-FREE WORKPLACE CERTIFICATION**

In case of tie bids, preference must be given to vendors submitting a certification with their bid/ proposal certifying they have a drug-free workplace in accordance with Section 287.087, Florida Statutes. The drug-free certification form below must be signed and returned with your bid.

In order to have a drug-free workplace program, a business shall:

(1) Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition. (2) Inform employees about the dangers of drug abuse in the workplace, the business' policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations. (3) Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in the first paragraph. (4) In the statement specified in the first paragraph, notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction. (5) Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted. (6) Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this firm complies fully with the above requirements.

Vendor's Signature, Title, Date Dennis J. Johnson/Contract Specialist 12-23-04

STATE OF Minnesota
COUNTY OF Ramsey

PERSONALLY APPEARED BEFORE ME, the undersigned authority Dennis J. Johnson
who, after being first sworn by me, affixed his/her signature in the space provided above on this 23rd day of
December, 20 04.

Personally known Produced I.D. _____

Notary Public

PLEASE COMPLETE AND SUBMIT WITH BID
>>>>Failure to submit this form with your bid may disqualify your response.<<<<

