



Invitation to Bid

PLEASE BID THE FOLLOWING ATTACHED PROJECT:

Project Information:

Project No.: **581708** Name: **City Wayfinding Signage**

Bid Submittal Deadline:

Time: **10:00 am** Date: **January 10, 2018**

Notice is hereby given that sealed bids for the below listed bid will be received by the Engineering Division, City of Kelso, 203 South Pacific Ave. Suite 205, until 10:00am, January 10th, 2018 and immediately thereafter be publicly opened and read. Late bids will be rejected.

City Wayfinding Signage – PN 581708

BID SUBMITTAL OPTIONS:

******Clearly identify the above bid/project number on your bid envelope***

Mail	Email/Fax	In Person
City of Kelso Engineering Department Attention: Nina Caulfield PO Box 819 203 S. Pacific Ave. Suite 205 Kelso, WA 98626	Not Accepted	City Hall 203 S. Pacific Ave. Suite 205 (2 nd Floor) Kelso, WA 98626

QUESTIONS?:

Submit in writing at the above mailing address or the below email addresses by Jan 5, 2017

Project Details	Bid Documents
Steve Taylor City Manager staylor@kelso.gov	Nina Caulfield Project Coordinator ncaulfield@kelso.gov

INVITATION TO BID

Date of Request:	December 13, 2017
Name of Project:	City Wayfinding Signage
Proposed Start Date:	Upon Council Award, currently scheduled for January 16, 2018
Duration of Project:	To be complete and delivered no later than March 31, 2018
Delivery Address:	PO Box 819 or 203 South Pacific Avenue, Kelso, WA 98626

I. INVITATION AND INTENT

- 1. Wayfinding Master Plan** - the City of Kelso has completed a Wayfinding Master Plan and is seeking a vendor to fabricate and deliver 60 signs of varying sizes in accordance with design specifications contained within the master plan and the accompanying bid request attachment.
- 2. Quality** - Signage that fails to meet city-provided specifications will be rejected upon delivery.
- 3. Rejections** - the City reserves the right to reject any and all bids and to waive informalities and minor irregularities in bids received and to accept any portion of the bid or all items bid if deemed in the best interest of the City of Kelso.

II. SCOPE OF SERVICES REQUESTED

A. Style guide

- 1. Logo** - all graphic applications of the Kelso logo must be properly staged with adequate clear space surrounding the logo to set it apart from all other visual elements of the communication including photographs, illustrations, typography, or the edges of the printed surface.
- 2. Colors** - will be in accordance with a 4-color process based on Pantone specifications including:

Sign face logo icon Colors	Destination blades							
	Dark blue	Blue	Gold	Red	Dark Blue	Blue	Brown	Green
Cyan	100%	98%	15%	25%	100%	100%	36%	100%
Magenta	85%	74%	27%	97%	85%	100%	68%	0%
Yellow	23%	8%	100%	100%	23%	13%	100%	75%
K(black)	10%	0%	0%	21%	10%	18%	32%	60%

- 3. Fonts** - of the Kelso name logo is Monotype Corsiva that is unique and shall not be repeated or incorporated in any font or wording applications. The font for the gateway and wayfinding destination blades shall be Helvetica Bold Condensed. The fonts on the Downtown Directory shall be Helvetica Regular for the Downtown Directory title and for the Points of Interest
- 4. Downtown directory map** - graphics are unique and will be incorporated into the Downtown Directory sign as a vector file, jpeg, pdf, and/or .tif file by the City of Kelso.
- 5. Quick Response (QR codes)** - will be provided by the City of Kelso and will be incorporated into the Downtown Directory.
- 6. Tartan Plaid** - is a custom 4-color graphic that will be provided as a vector file, jpeg, pdf, and/or tif file by the City of Kelso.

B. Sign materials and production

- 1. Sign materials** - will be constructed of 1/8 inch aluminum **or an approved equivalent** that won't swell, corrode, rot, wick water, or delaminate under prolonged water exposure **subject to the manufacturer's**

warranties. Sign blanks shall be new stock, free from defects impairing strength, durability, or appearance including buckles, warps, burrs, dents, cockles, or other defects.

2. Sign layers - will consist of a composited front panel layer with the Kelso icon and wayfinding destination blades and a die cut wave shape at the bottom, a middle panel layer of 1/2" thick 4" x 4" aluminum spacers for large signs over 40 inches in width or 1/4" thick 4" x 4" aluminum spacers for smaller signs under 28 inches in width, and a back panel layer of a Tartan Plaid design with a die cut wave shape at the bottom.

3. Sign graphic contents - will be digitally printed on 3M Advanced Engineer Grade Prismatic Sheeting Series 7930 with 3M Piezo Inkjet Series 8900UV Link using 3M Process Color Series 880I with 3M Premium Protective Overlay Film Series 1160 to protect against common graffiti including paints, permanent market ink, lipstick, eggs, and stickers subject to 3M performance warranties **or an approved equivalent** equal to 3M life warranties.

4. Shipping and handling - completed signs will be shipped, handled, and stored so that corners, edges, and faces are not damaged. Signs damaged in shipment will not be accepted by the City of Kelso. All goods are to be shipped prepaid, FOB Destination.

C. Sign mounting extrusion and stiffening

1. Sign channel extrusion and stiffener - will be Signfix 6061-T6 aluminum alloy large 1 ½" x 1 ½" channel mounting extrusion/stiffeners cut to length to frame the backside of the sign as shown on the specification sheets or as determined to be appropriate using Signfix Stiffener Spacing Software **or an approved equivalent**. The City of Kelso will provide Signfix mounting hardware and install all signs.

2. Channel mounting - will be to the backside of the sign using 3M 4955 VHB double-sided 80 mil (2.0mm) white closed-cell acrylic foam carrier in accordance with Surface Preparation for 3M VHB Tape Bonding Procedure subject to 3M warranties **or an approved equivalent**.

D. Performance requirements

1. Workmanship - the Vendor will provide signs of workmanship and materials, free of defects. Defects shall be defined as, but shall not be limited to delamination, abnormal deterioration, fading and discoloration, weathering, failure of securing to substrates indicated, cracking, corrosion or coating damage, or visible scratches on surfaces.

2. Manufacturer's code - signage shall not bear manufacturer's code or other identifying marks on any area or part, which may be visible in the sign. Date stickers are to be affixed to the back of signs.

E. Submittals

1. Graphics - the City will provide Illustrator CS 5 (.ai) files and Adobe Acrobat (.pdf) design documents that will be used by the Vendor in the production of all signs.

2. Samples - the selected Vendor shall submit samples and color match samples (colors and finishes as indicated on drawings) for each sign type including:

- Sign material, printing, and color match samples.

III. AWARD CRITERIA

1. Criteria - the City of Kelso will award the bid for the products and services that will serve the City's best interest using the following criteria when evaluating bids:

- Meets or exceeds bid specifications for production quality **as determined by the submittal of one example fabrication as specified below**.
- Is a printing and fabrication that complements and enhances the aesthetics of the sign specification
- Total Cost to the City of Kelso
- Results of Reference Checks - for the bidder whose bid is under consideration for award for verification. The City may determine based on reference checks that the bidder is not a responsible bidder and may award to the next lowest bidder who meets the bidder qualification requirements.

IV. BID SUBMITTAL REQUIREMENTS

1. Example production submittal - Vendors shall submit one example fabrication of the Gateway 1 sign at 25% of original scale (equal to 17 inches wide x 17.75 inches high of the full size 68 inches wide x 71 inches high sign) with the bid submittal **using City of Kelso supplied Illustrator CS 5 (.ai) file or Adobe Acrobat (.pdf) file** that meets or exceeds the materials and performance requirements specified above to verify their ability to meet minimum bid specification requirements. **The example production submittal will represent a quality guarantee of the Vendor's ability to meet or exceed specification quality and will constitute the minimum quality standard required of the successful bidder of all future sign productions.**

2. Bid sheet - all vendors shall submit a completed Bid Sheet (below) with total costs for supplying each and all signs. The bid total shall be separated into the costs for initial setup, each sign type, and include applicable sales tax and delivery charges. Prices shall be shown in legible figures (not words) written in ink or typed. **Delivery of finished sign products to the City is required. The City will install all signs - sign installation is not included in this request for bid.** Bids shall be completed on the form furnished and any exceptions to the specifications must be attached hereto and made a part of the contract. Retain one copy for your records.

3. Warranty Guarantee - all vendors shall submit the completed Warranty Guarantee (below) with the submittal of the bid.

4. Comparable projects - on a separate sheet of paper attached to the Bid Sheet, the Vendor will list the projects that have been completed within the past 5 years that are similar to that requested in this Invitation for Bids including:

- Project name
- Final contract amount and working days
- Project owner
- Owner contract name and phone number
- Project description
- Project completion date
- Role as prime or subcontractor
- Publicly funded project - yes or no and source of funds

5. City services - identify all services if any, that the City of Kelso is expected to provide.

VI. BIDDER REQUIREMENTS

1. Washington State requirements - all bidders must meet the following state responsibility criteria:

- At the time of bid submittal, have a current certification of registration in compliance with Chapter 18.27 RCW.
- Successful Vendor must complete a W-9 form (Taxpayer Identification No.) and remit to the Finance Department.
- Have a current Washington State Unified Business Identifier (UBI) number.
- Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3).
- If applicable:
 - Have Industrial Insurance (workers' compensation) coverage for the Bidder's employees working in Washington State, as required under Title 51 RCW;
 - Have a Washington State Employment Security Department number, as required in Title 50 RCW;
 - Have a Washington State Department of Revenue state excise tax registration number, as required in Title 82 RCW.

VII. GENERAL CONDITIONS

1. Reserved rights - the City reserves the right to:

- Modify or cancel the selection process or schedule at any time;
- Waive minor irregularities;
- Reject any and/or all responses to this ITB and to seek new proposals when it is in the best interest of the City to do so;

- Seek clarification or additional information from respondents as it deems necessary to the evaluation of the response;
- Request any additional information or evidence from individual respondents, including but not limited to evidence of the respondent's financial status;
- Incorporate this ITB and the selected Vendor's response to this ITB as a part of any formal agreement between the City and the Vendor;
- Negotiate modifications to the ITB with the selected respondent as part of the negotiation process.
- Modify the ITB opportunity available to potential Vendors.
- Reject any and all quotes and to waive informalities and minor irregularities in quotes received and to accept any portion of the quote if deemed in the best interest of the City of Kelso.

2. Hold harmless: By participation in this ITB process, Vendors agree to hold harmless the City of Kelso, its officers, and employees from all claims, liabilities, and costs related to all aspects of the bid selection process.

3. Public information: All documents, conversations, correspondence, etc. between the City and Vendors are public information subject to the laws and regulations that govern the City of Kelso, unless specifically identified otherwise.

4. Expenses: All expenses related to any Vendor's response to this ITB, or other expenses incurred while the selection process is underway, are the sole obligation and responsibility of that Vendor.

5. Ownership: The City of Kelso shall own the rights to any and all fabrications including but not limited to printing and production approved by the City.

6. Payment Terms: Net 45 after delivery, receipt of invoice, and acceptance of satisfactory compliance.

7. Contract: The contract shall consist of the following documents: The Request for Proposals (RFP), the accepted proposal, the purchase order issued by the City and any agreed upon written changes to any of the foregoing documents. The contract documents are complimentary and what is called for in any one document shall be binding as if called for by all.

8. Technical questions - regarding this project must be received in writing (emails are accepted) by January 5th, 2018 to ensure adequate time for the City's response to be posted to the bidding webpage for all to access.

**City Wayfinding Signage
 Bid Form
 Project No. 581708
 Bids Due: January 10th, 2018 at 10:00 am**

Initial Artwork/Setup		Lump Sum		\$
Sign type	Size (width x ht)	Cost/sign	Number	
Gateways (G1-G7)	W=68 to 75 inches H=71 to 88 inches	\$	7	\$
Wayfinding (W1-W30)	W=40 inches H=44 to 78 inches	\$	30	\$
Directories (D1-D11)	W=16 inches H=44 inches	\$	11	\$
Parking (P1-P5)	W=28 inches H=58 inches	\$	5	\$
Trails (T1-T7)	W=26 inches H=40 inches	\$	7	\$
Subtotal fabrication cost				\$
8.1% Washington State Sales Tax				\$
Shipping and handling				\$
Total bid				\$

Note - prevailing wage does not apply to this bid as a wayfinding signage system is a tourist-supporting project and not a public work as defined in RCW 39.04.

Your quotation shall be considered non-responsive and therefore, void if:

- Figures are illegible
- Minimum bid requirements are not met (when applicable)
- Bids are not on this bid form
- If the bid form is not signed

Bids shall be valid for 120 days ^{SEP}

The following Addenda is/are hereby acknowledged:

Addendum Number	Date	Signature

**City Wayfinding Signage
Bid Form
Project No. 581708
Bids Due: January 10th, 2018 at 10:00 am**

THE FOLLOWING STATEMENTS ARE HEREBY ACKNOWLEDGED:

Condition	Yes	No
Delinquent sales tax - are you listed on the Department of Revenue "Delinquent Taxpayer List" Website http://dor.wa/Content/FileAndPayTaxes/LateFiling/dtlWest.aspx ? If yes, a written payment plan will be required.		
Federal Government - are you listed on as having an "active exclusion" on the US Government's System for Award Management database https://www.sam.gov ?		
Public bidding crime - have you been convicted of a crime involving bidding on a public works contract in the 5 years prior to the bid submittal date?		
Termination for cause/termination for default - have you had any public contract terminated for default or cause by a government agency within the 5 years from the date of bid submittal? If yes, a report describing the circumstances of such termination or default will be required.		
Lawsuits - have judgments been entered against you within the past 5 years from the date of bid submittal relating to contract enforcement or breach? If yes, a report containing an explanation of the circumstances surrounding each such lawsuit will be required.		

NON-COLLUSION DECLARATION

I, by signing the proposal, hereby declare, under penalty of perjury under the laws of the United States that the following statements are true and correct:

- That the undersigned person(s), firm, association or corporation has (have) not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the project for which this proposal is submitted.
- That by signing the signature page of this proposal, I am deemed to have signed and have agreed to the provisions of this declaration.

By the signature below, Bidder confirms that all information provided is true and correct.

Name of bidder	
Mailing address	Email
City, state, zip code	Telephone
Washington State Registration Number	Expiration date
Name of bidder's representative	UBI Number
Signature of representative	Date

**City Wayfinding Signage
Bid Form
Project No. 581708
Bids Due: January 10th, 2018 at 10:00 am**

WARRANTY / GUARANTEE

We hereby warrant and guarantee the signs, which will be delivered in accordance with the provisions of the City of Kelso Wayfinding Signage project, subject to the sign material, printing production, graphic and sign protection guarantees of the manufacturer (3M or an approved equivalent), from the date of delivery and acceptance by the City of Kelso.

We warrant and guarantee that the materials and finishes furnished under this contract are of the highest quality and new unless otherwise required or permitted by the contract documents; that the work will be free from defects not inherent in the quality required or permitted; and that the work conforms with the requirements of the contract documents.

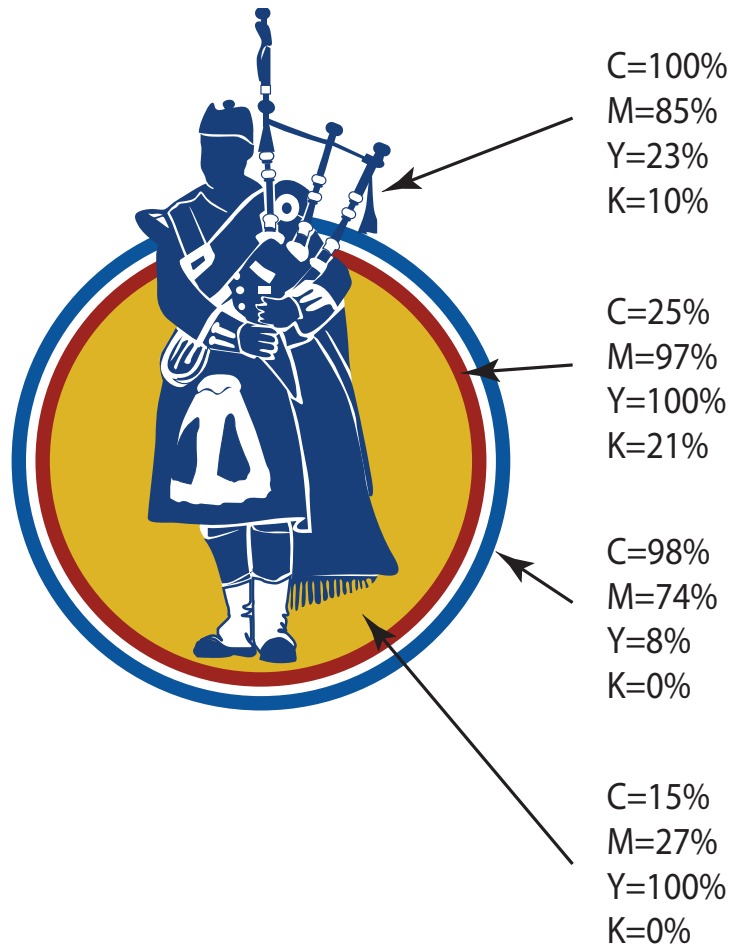
We agree to repair or replace, to the satisfaction of the City of Kelso, any or all work not conforming to the contract documents, including substitutions not properly approved and authorized, workmanship or materials that prove defective within the manufacturer's warranty / guarantee period. This warranty / guarantee excludes remedy for damage or defect caused by abuse, modifications not executed by the Vendor or normal wear and tear under normal usage. Any work that may be damaged or displaced by the abuse, modifications not executed by the Vendor, improper or insufficient maintenance or improper operation shall also be excluded.

Any repairs or replacements shall bear an additional 12-month guarantee, in addition to any remaining warranty period, as herein stated, from the date of final acceptance of repairs or replacement.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time after being notified in writing, we collectively and separately do hereby authorize the City of Kelso to proceed to have defects repaired and made good at our expense, and will pay the costs and charges; therefore, immediately upon demand.

Signature of representative

Date

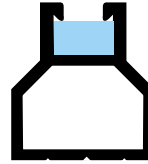
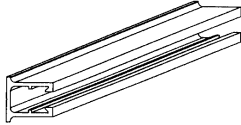


Aluminum channel sign extrusion/stiffener

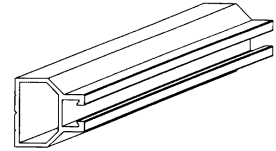
Signfix 6061-T6 Aluminum Large Channel Mounting Extrusion/Stiffener (or approved equivalent) affixed to back of aluminum sign face with 3M 4955 (or approved equivalent) VHB double-sided 80 mil (2mm) white closed-cell acrylic foam carrier



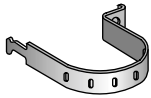
Medium Extrusion
(10' and 20' stock lengths)
For signs from 3' to 18' wide



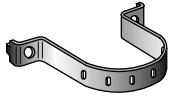
Large Extrusion
(10' and 20' stock lengths)
For signs 10' to 30' wide



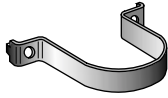
City of Kelso will install all signs using the hardware illustrated below.



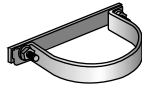
Anti-Rotational Twist-In Clamp



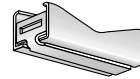
Anti-Rotational 2-Bolt "D" Clamp



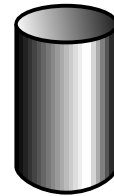
2-Bolt "D" Clamp
for two-bolt security



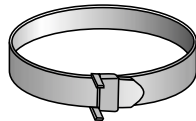
Heavy Duty 2-Bolt "D" Clamp with Insert for large diameter posts



Universal Channel Clamp for any diameter post – Attach with BAND-IT stainless steel band and buckle or UL Free ends



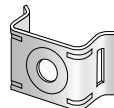
2-Bolt Mini "D" Clamp for small diameter vertical bars



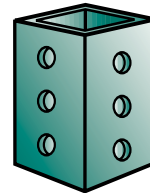
Bucklestraps for attaching Universal Channel Clamp



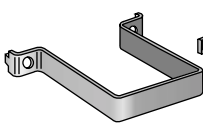
Stainless Steel Mounting Bracket



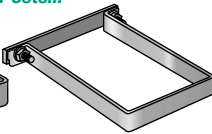
Swivel Mount Bracket



For Rectangular Posts...

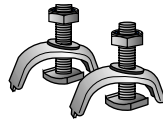


RHS Clamps

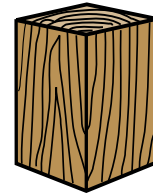


Heavy Duty RHS Clamps with Insert for extra strength

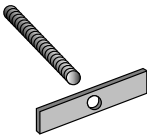
For Flanged Posts...



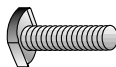
RSJ Clamp for I-Beam or U-Channel posts



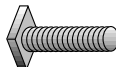
Accessories...



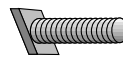
Threaded Stud with Insert plate for wood posts



Lip-Lok Bolt



Square Head Bolt



Twist-In Bolt



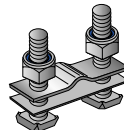
Lock Washer



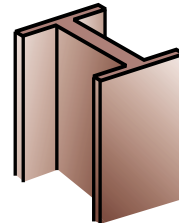
Nyloc Nut



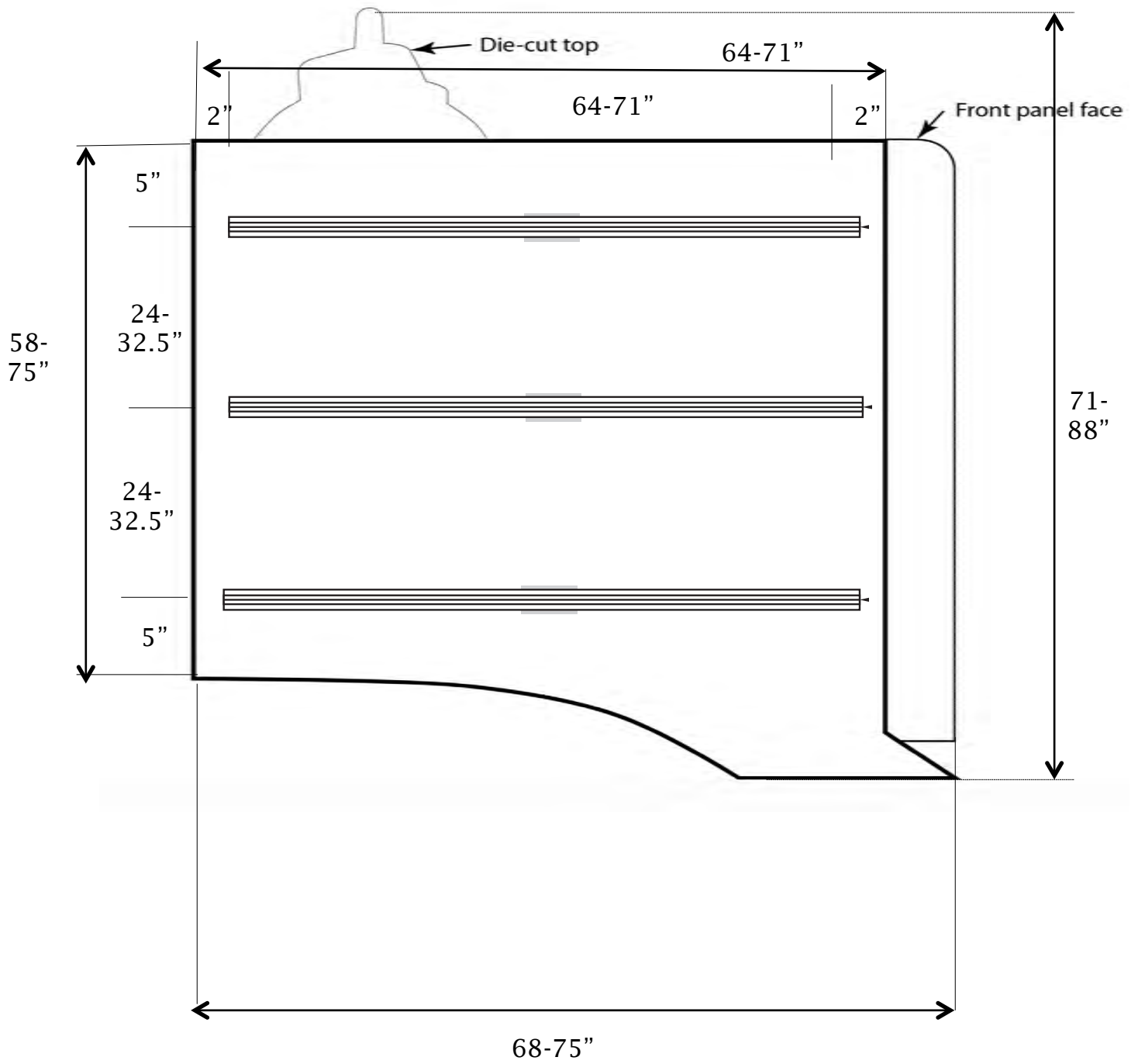
Vandal Proof Nut



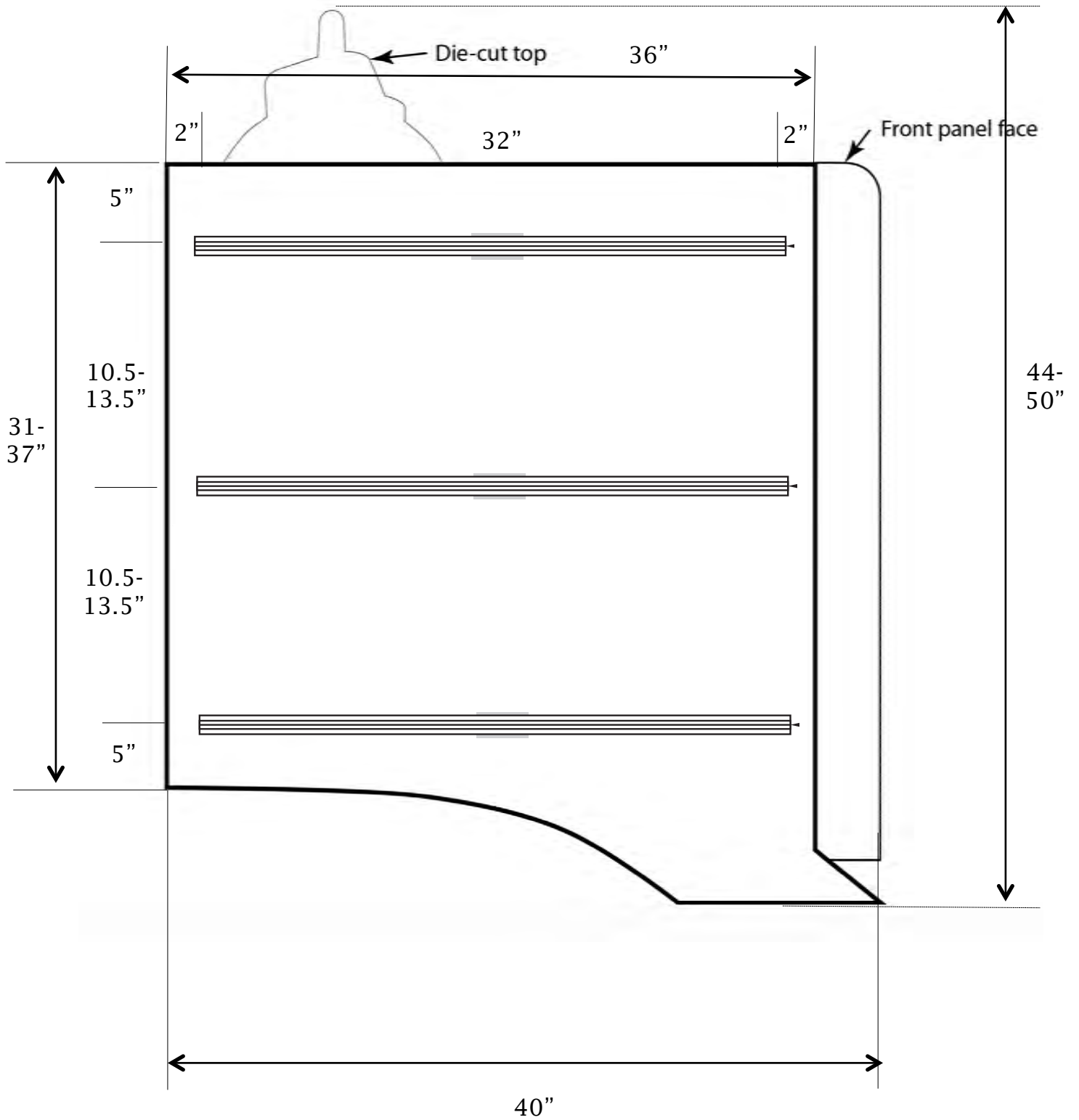
Span Wire Clip



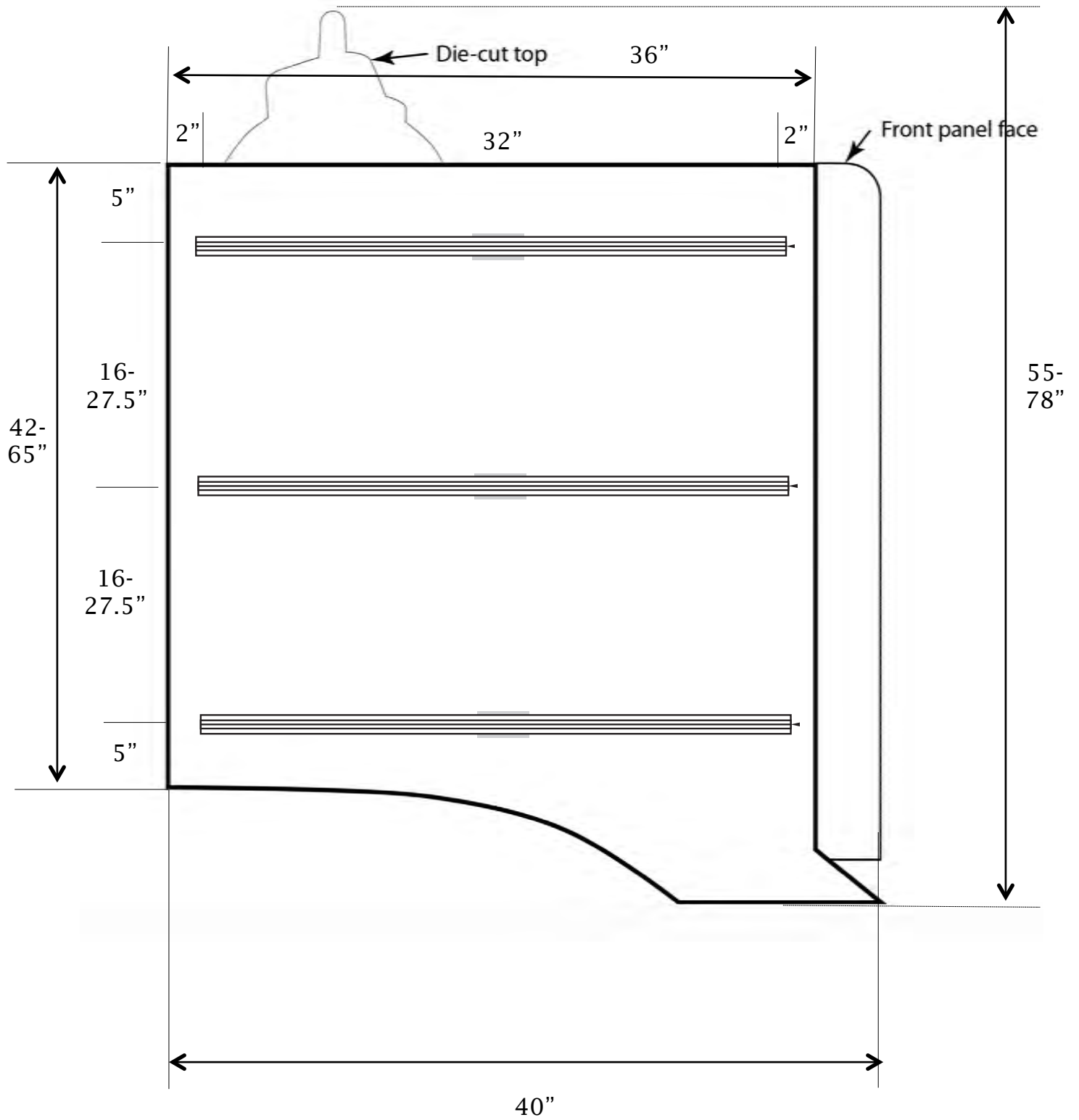
Gateway Signs (G1-G7)



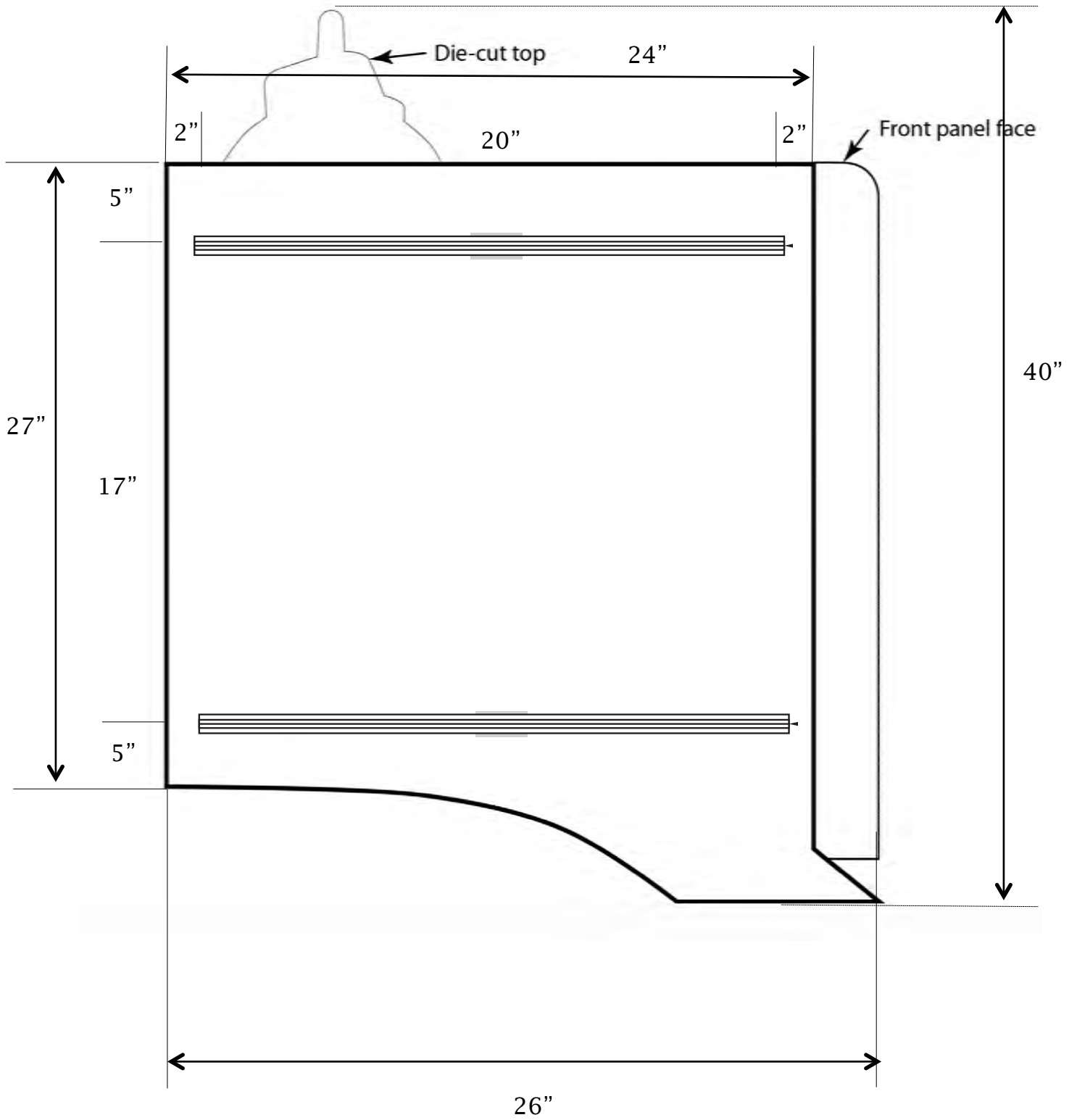
Wayfinding Signs (W3-4, 6-12, 15,21-23, 25-30)



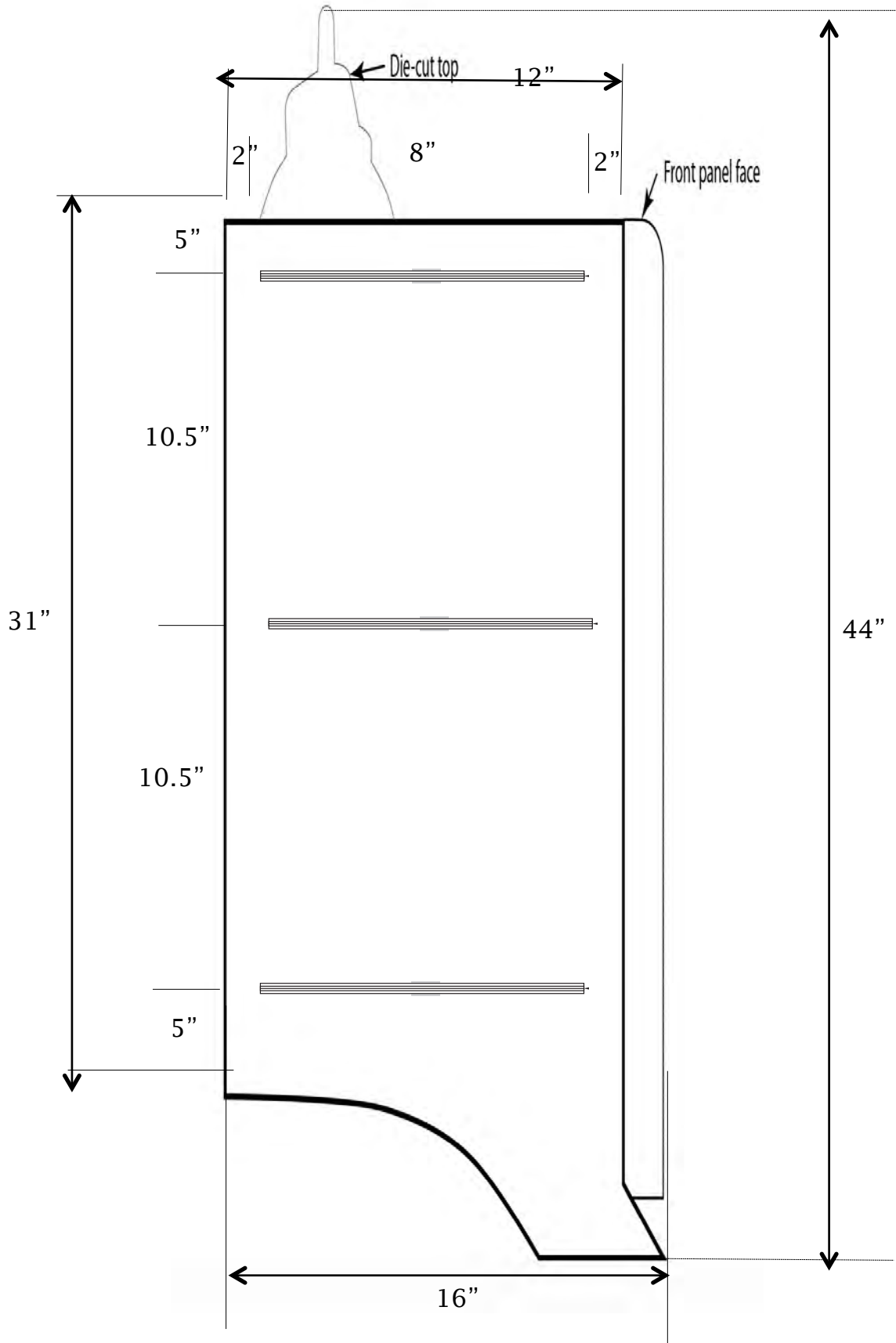
Wayfinding Signs (W1-2,5,13&19,14&27,16,17-18,20,24)



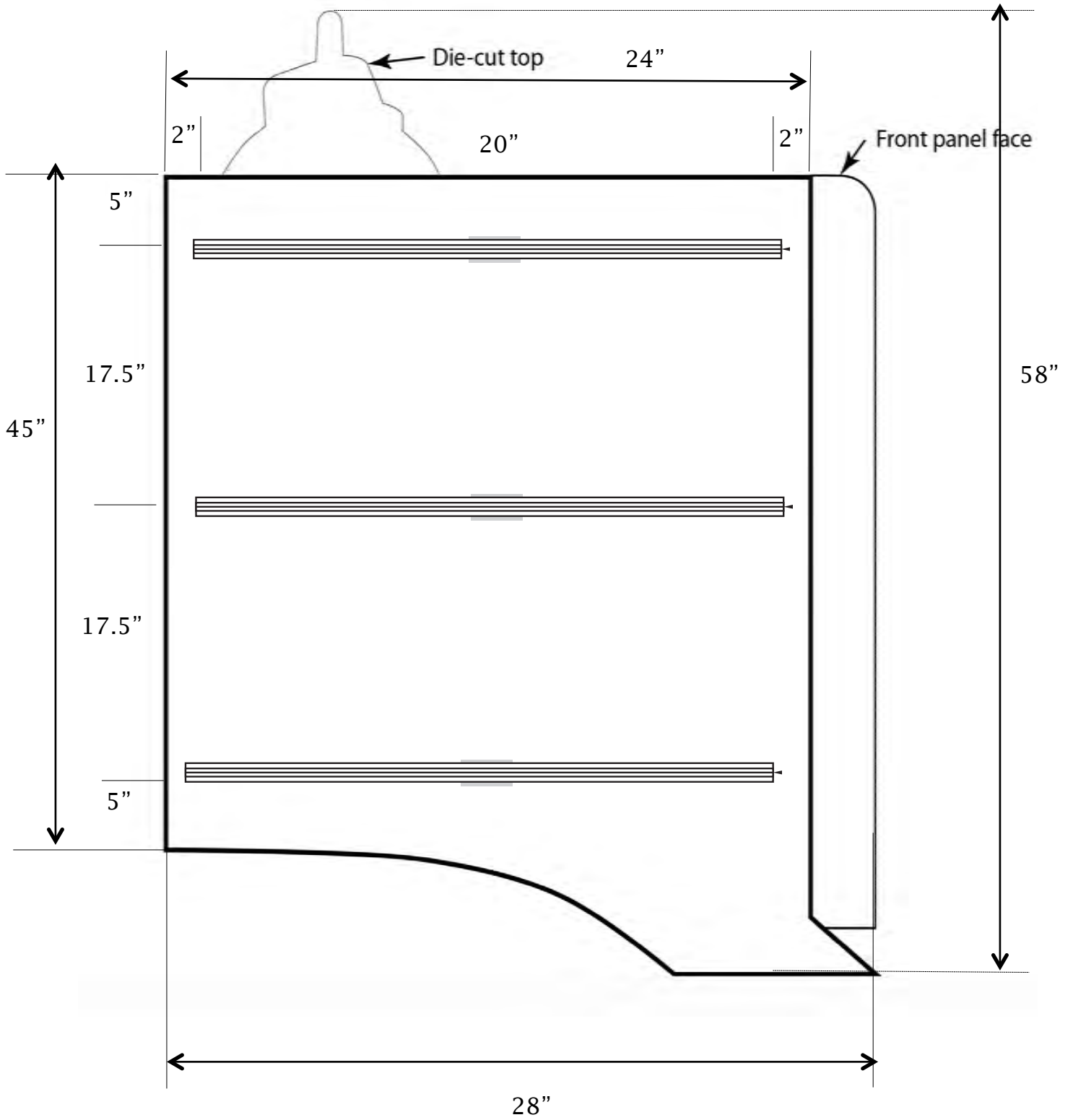
Trail Signs (T1-T7)



Directories (D1-D11)



Public Parking Signs (P1-P5)



City of Kelso, WA
TOSP/KVC/CM/HTD Sign Specifications

G1



City of Kelso, WA
TOSP/KVC/CM/HTD Sign#2 Specifications

G2



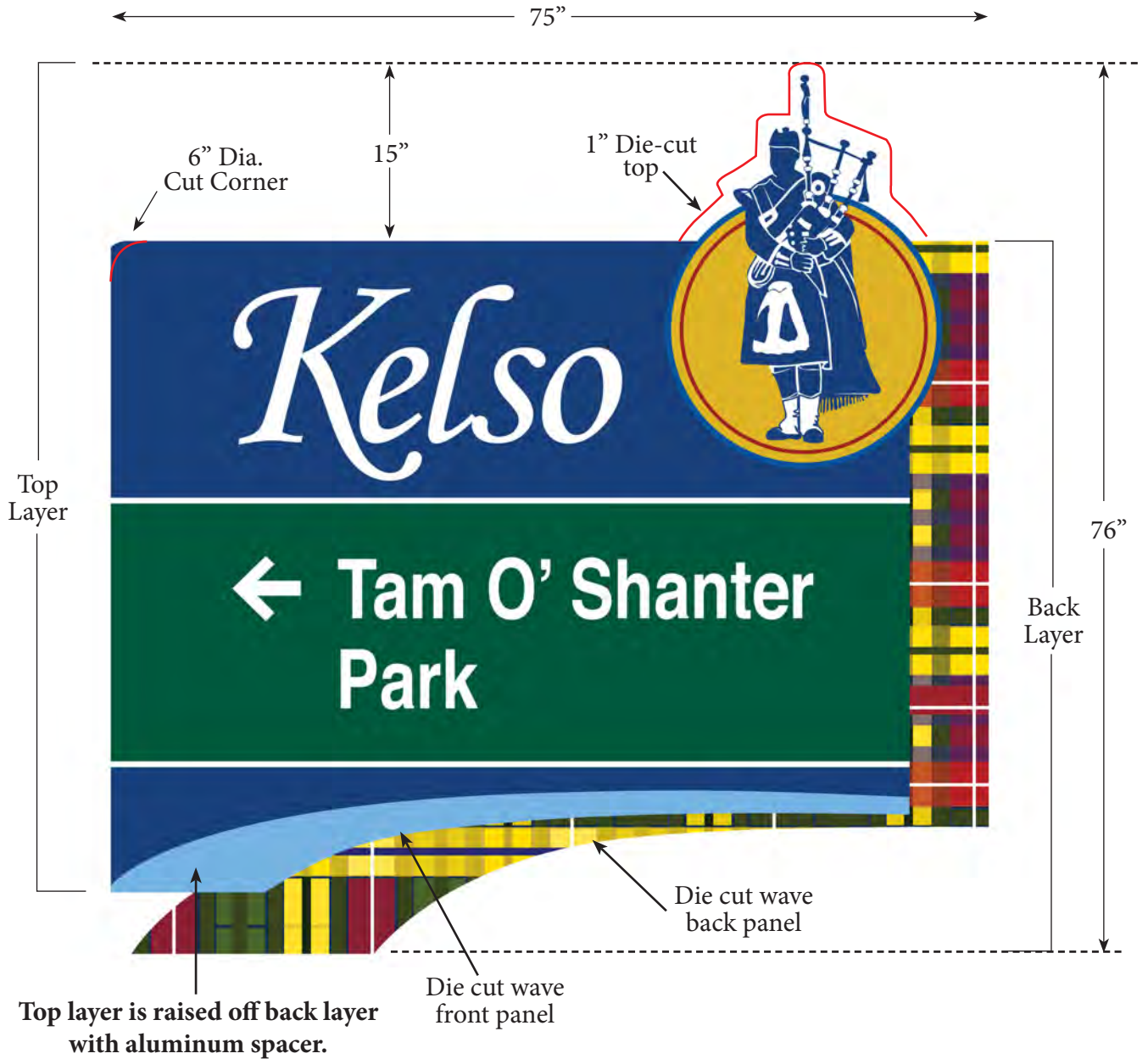
City of Kelso, WA
Industrial Area Regional Airport Sign Specifications

G3



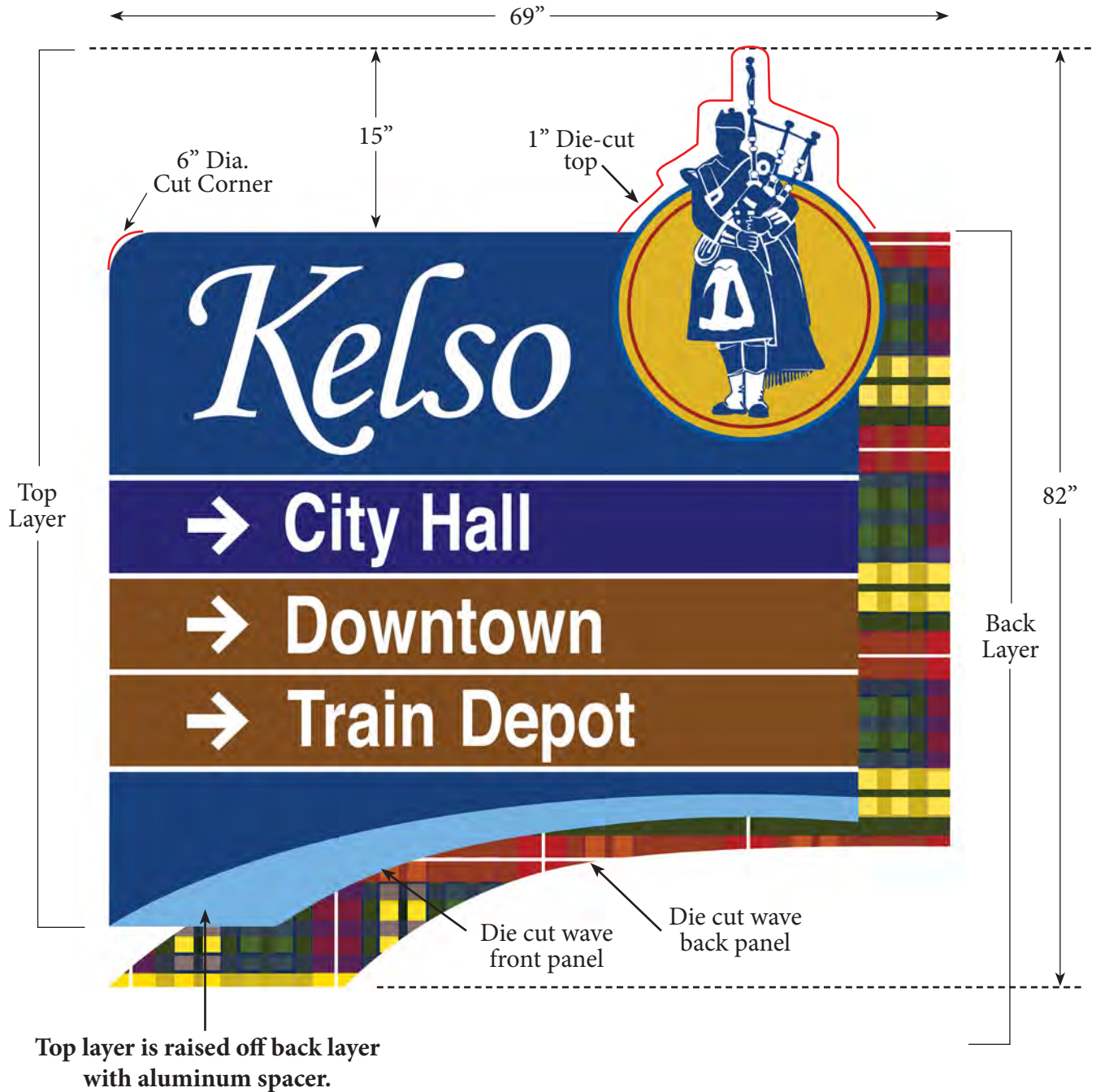
Top layer is raised off back layer with aluminum spacer.

Tam O' Shanter Park Gateway Sign Specifications



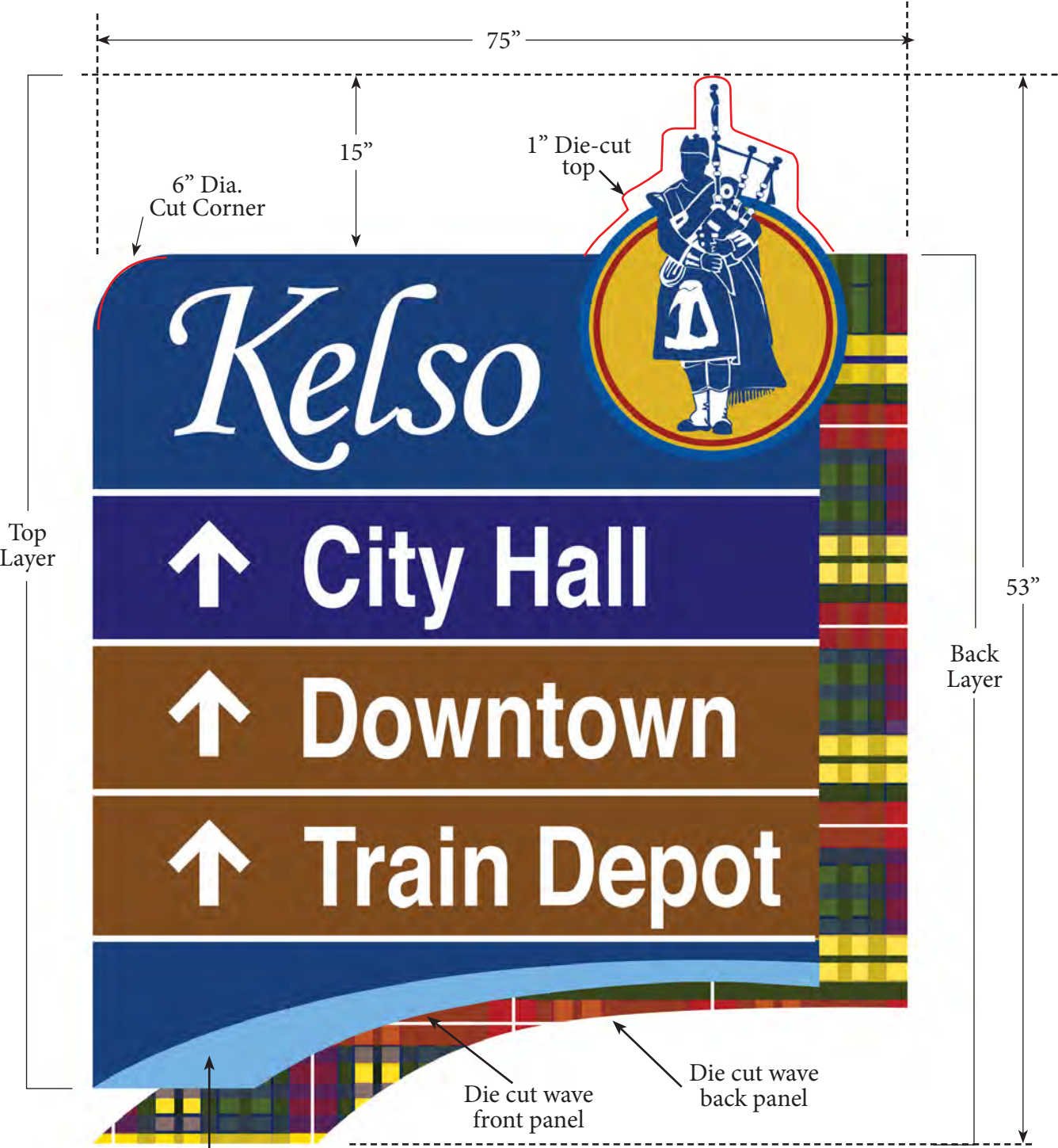
City of Kelso, WA
Gateway Sign Specifications
CH / Dt / TD (Arrows Right)

G5



City of Kelso, WA
CH / DT / TD Gateway Sign Specifications
(Up Arrows)

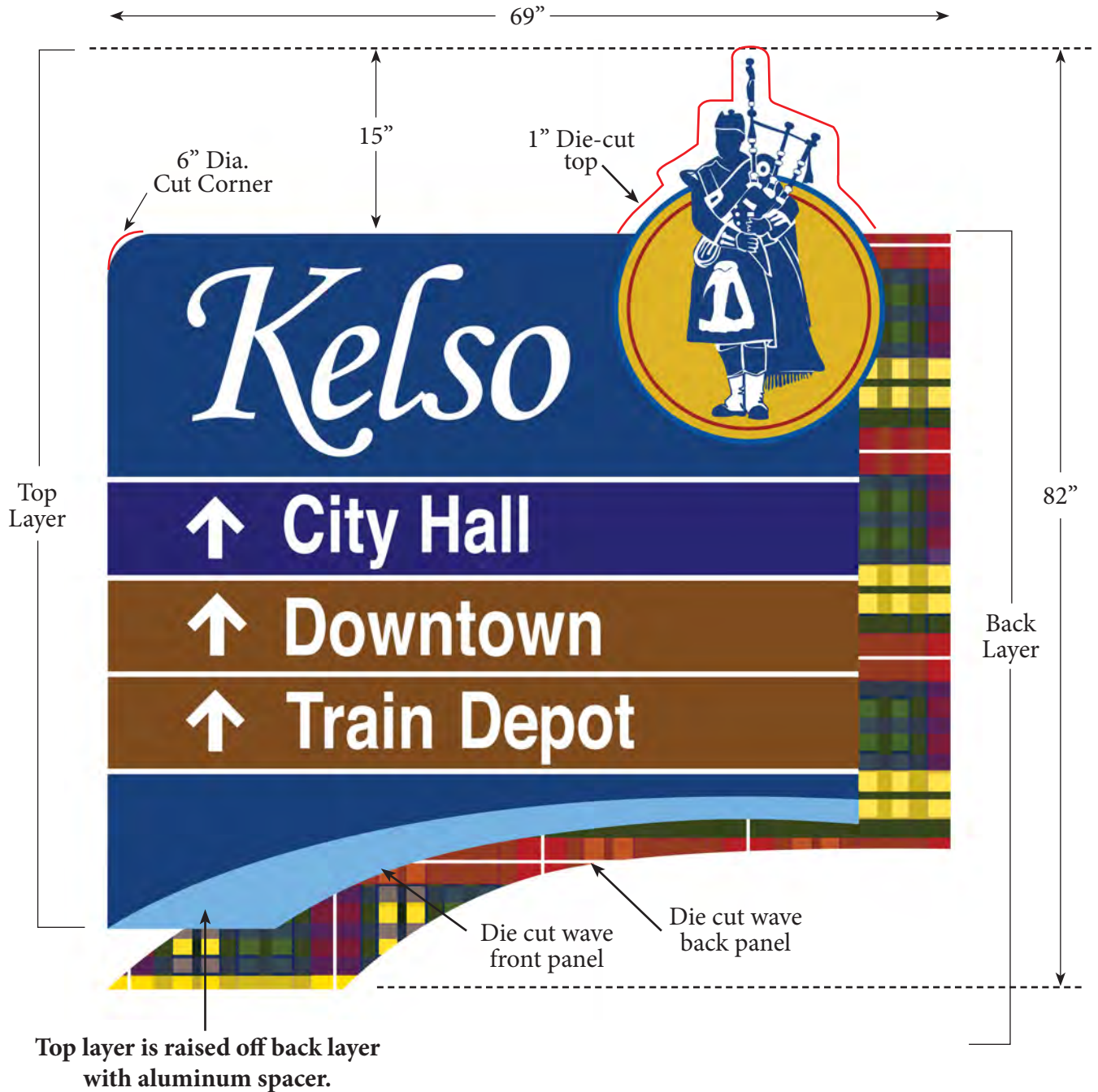
G6



Top layer is raised off back layer with aluminum spacer.

City of Kelso, WA
Gateway Sign Specifications
CH / Dt / TD (Arrows Up)

G7



City of Kelso, WA
Visitor Center / Skate Park Sign Specifications

W1



Top layer is raised off back layer
with aluminum spacer.

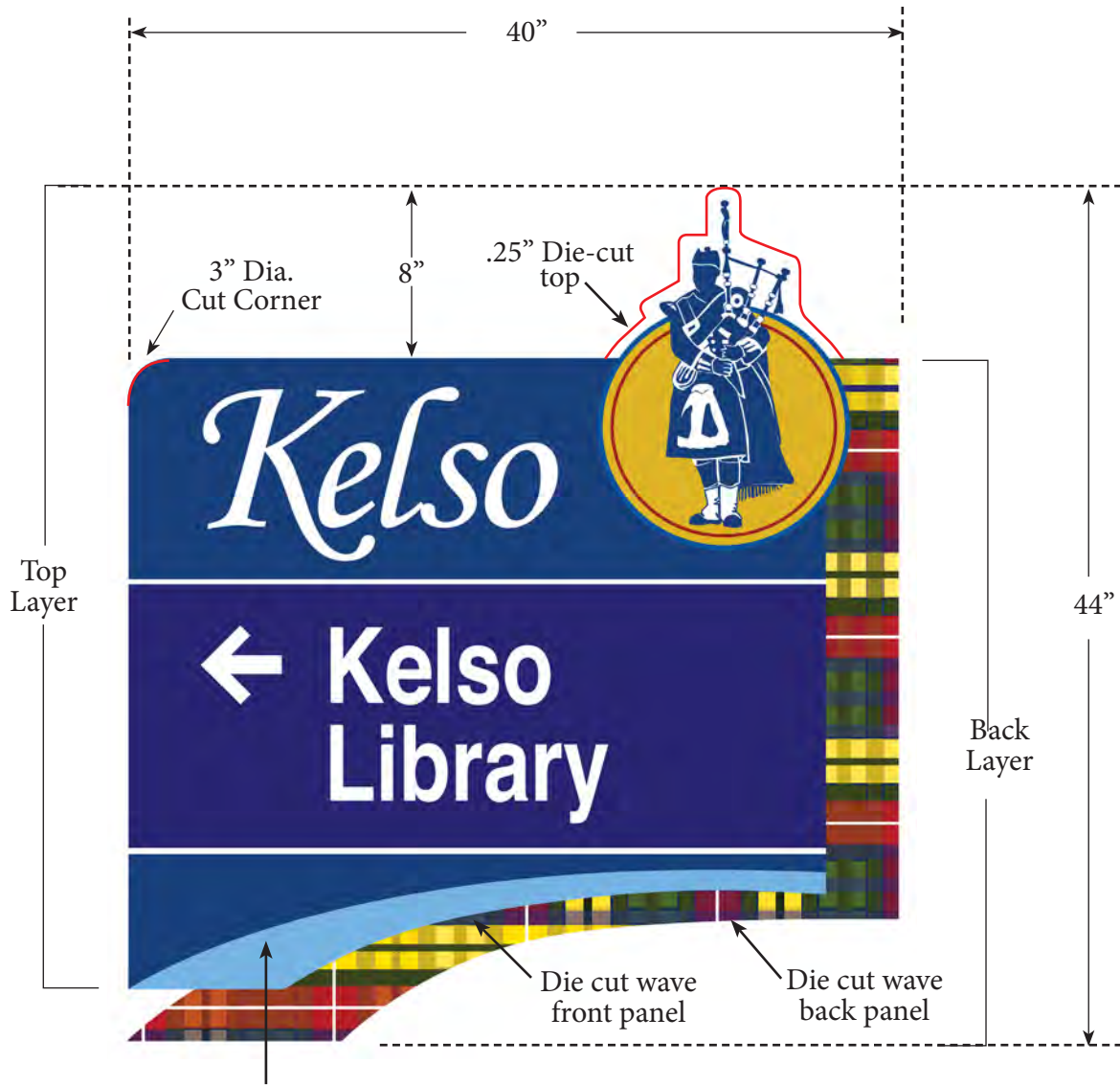
Visitor Center/Skate Park/Tam O' Shanter Park Sign Specifications



Top layer is raised off back layer with aluminum spacer.

City of Kelso, WA
Kelso Library Sign Specifications

W3-4



Top layer is raised off back layer with aluminum spacer.

City of Kelso, WA
Industrial Area, Airport Sign Specifications

W5



City of Kelso, WA
Regional Airport Sign Specifications

W6



**Top layer is raised off back layer
with aluminum spacer.**

City of Kelso, WA
Regional Airport Sign Specifications

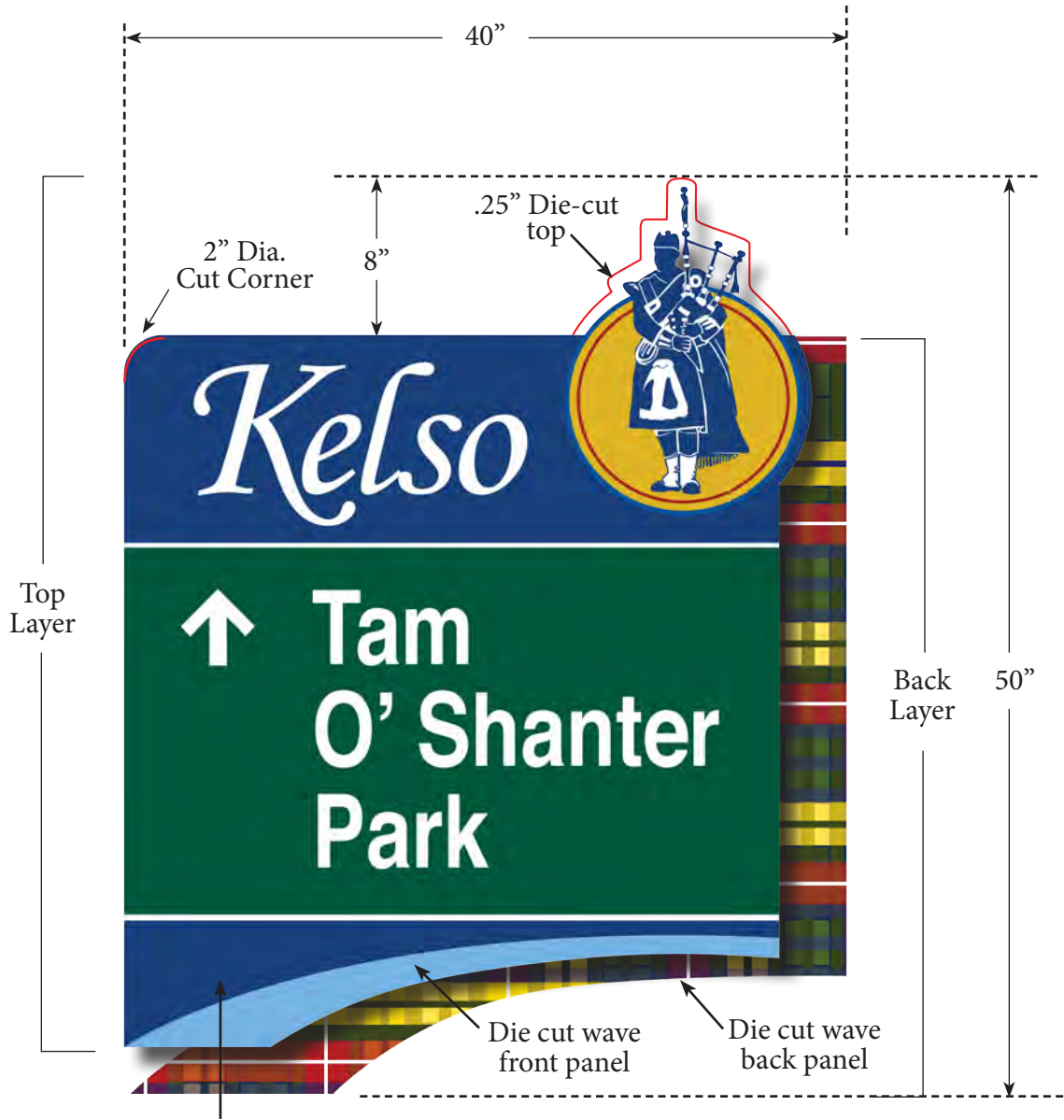
W7



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Tam O' Shanter Park Sign Specifications

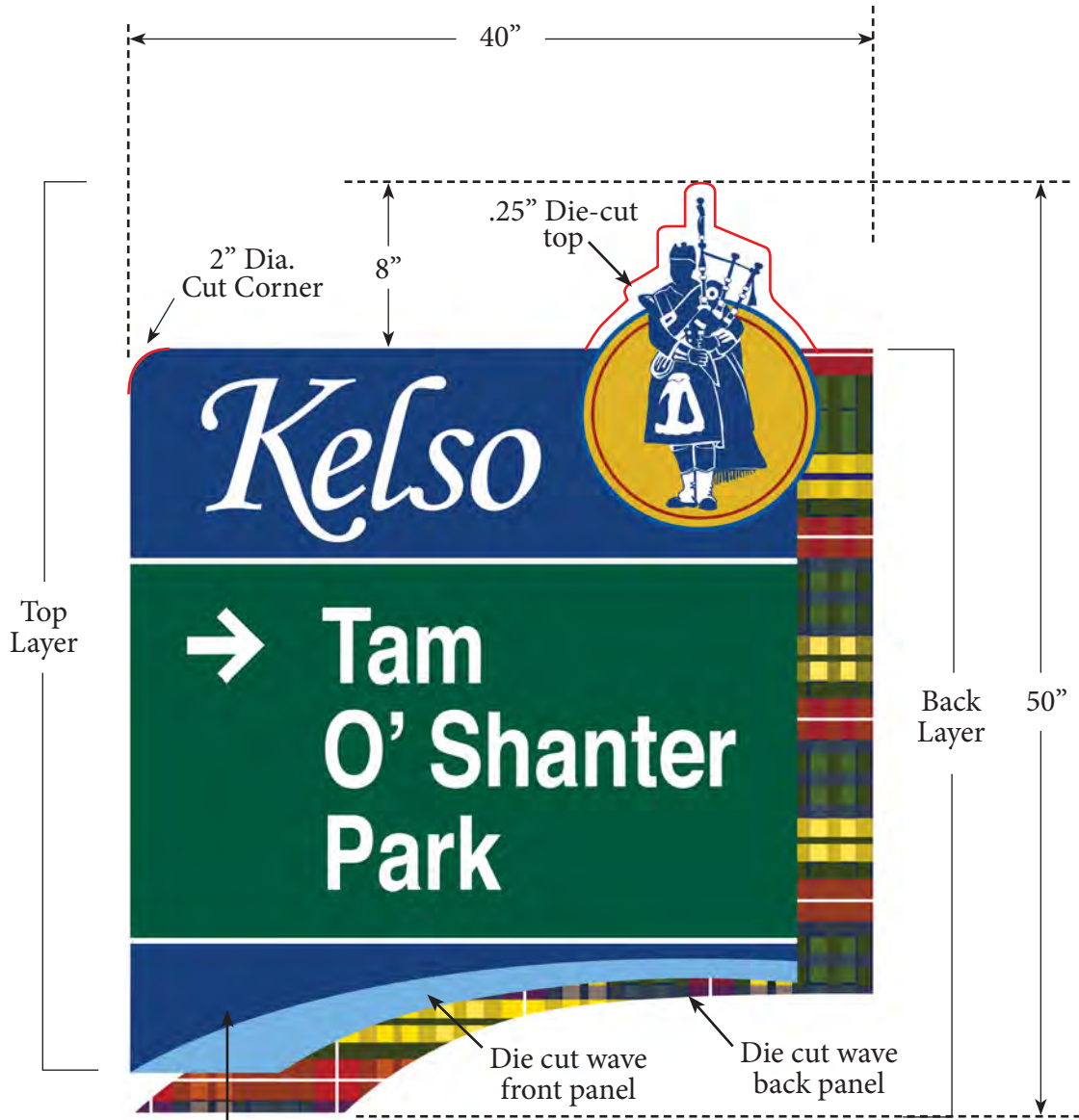
W8



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Tam O' Shanter Park Sign Specifications
(Right Arrow)

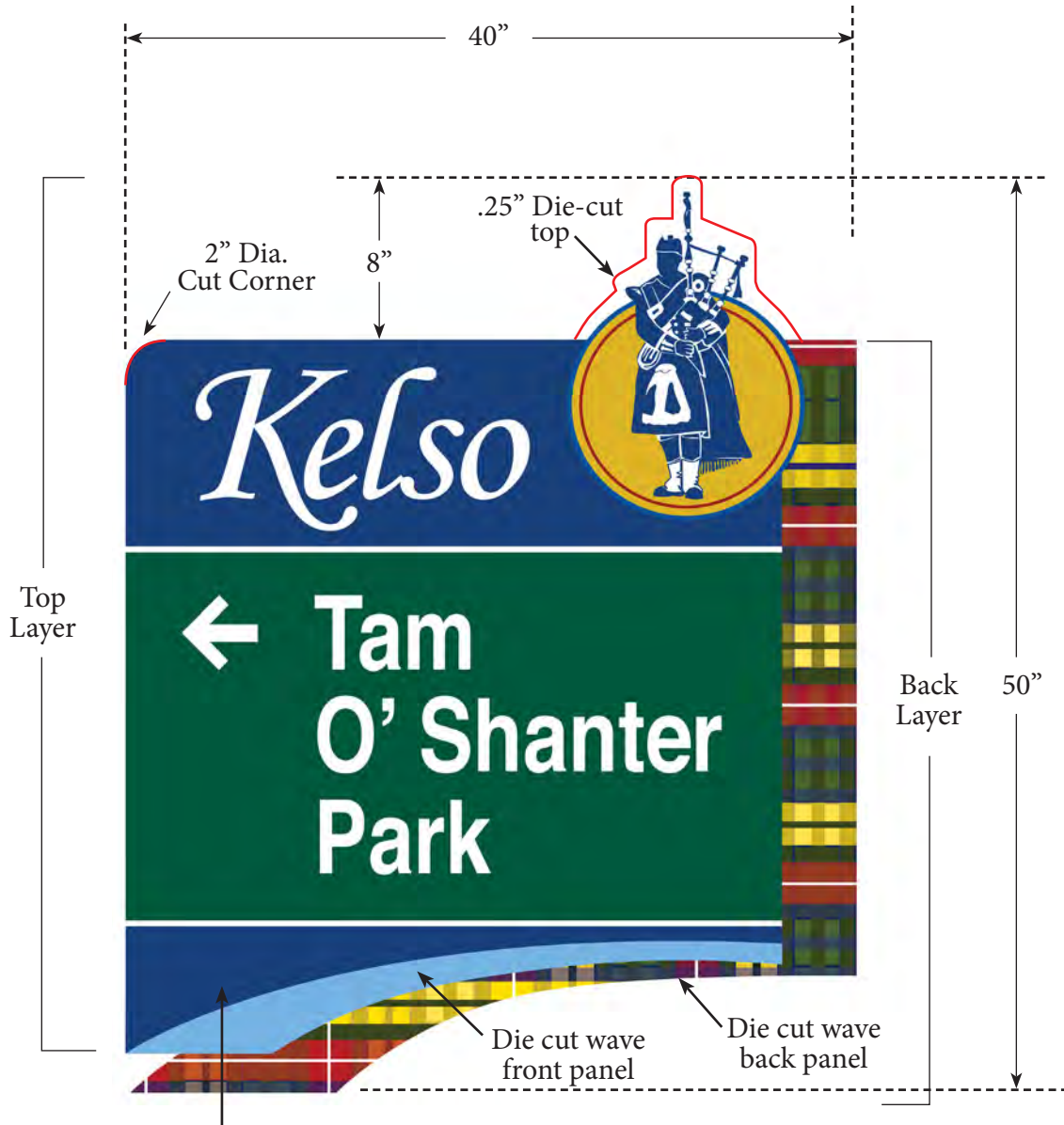
W9



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Tam O' Shanter Park Sign Specifications
(Arrow Left)

W10



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Regional Airport Sign Specifications
(Right Arrow)

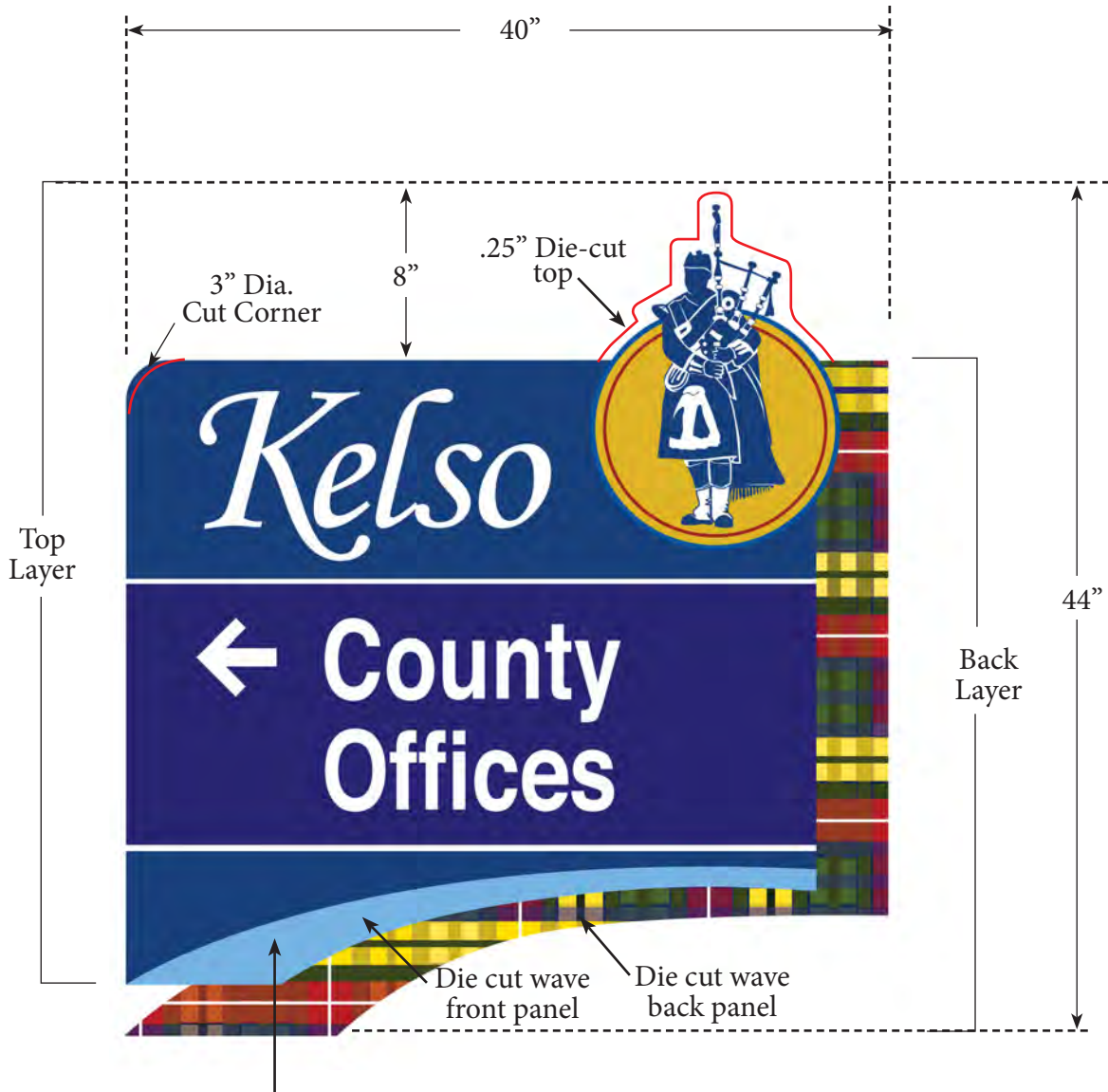
W11



**Top layer is raised off back layer
with aluminum spacer.**

City of Kelso, WA
County Offices Sign Specifications

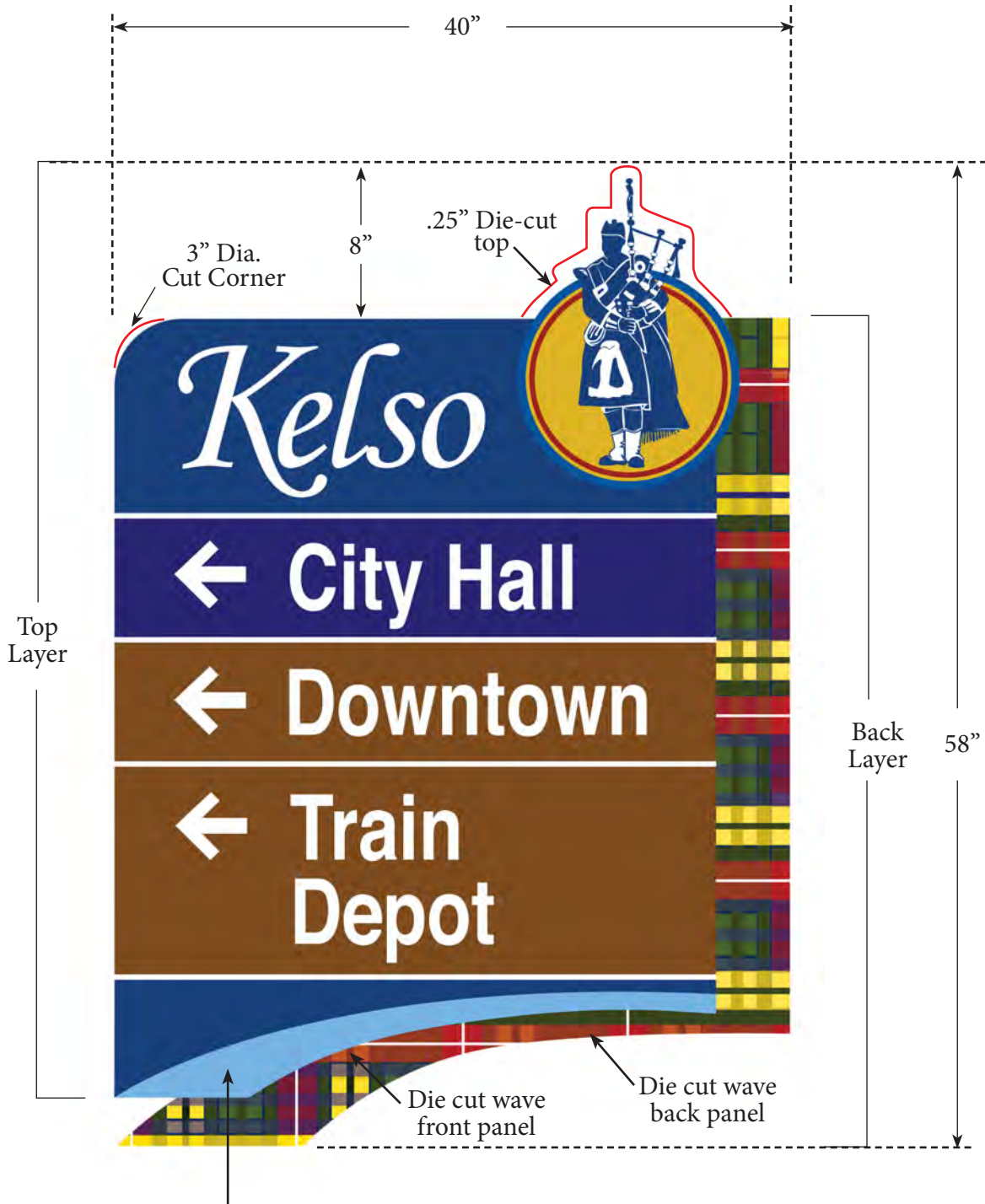
W12 & 21



**Top layer is raised off back layer
with aluminum spacer.**

City of Kelso, WA
City Hall / Downtown / Train Depot Sign Specifications
(Arrows Left)

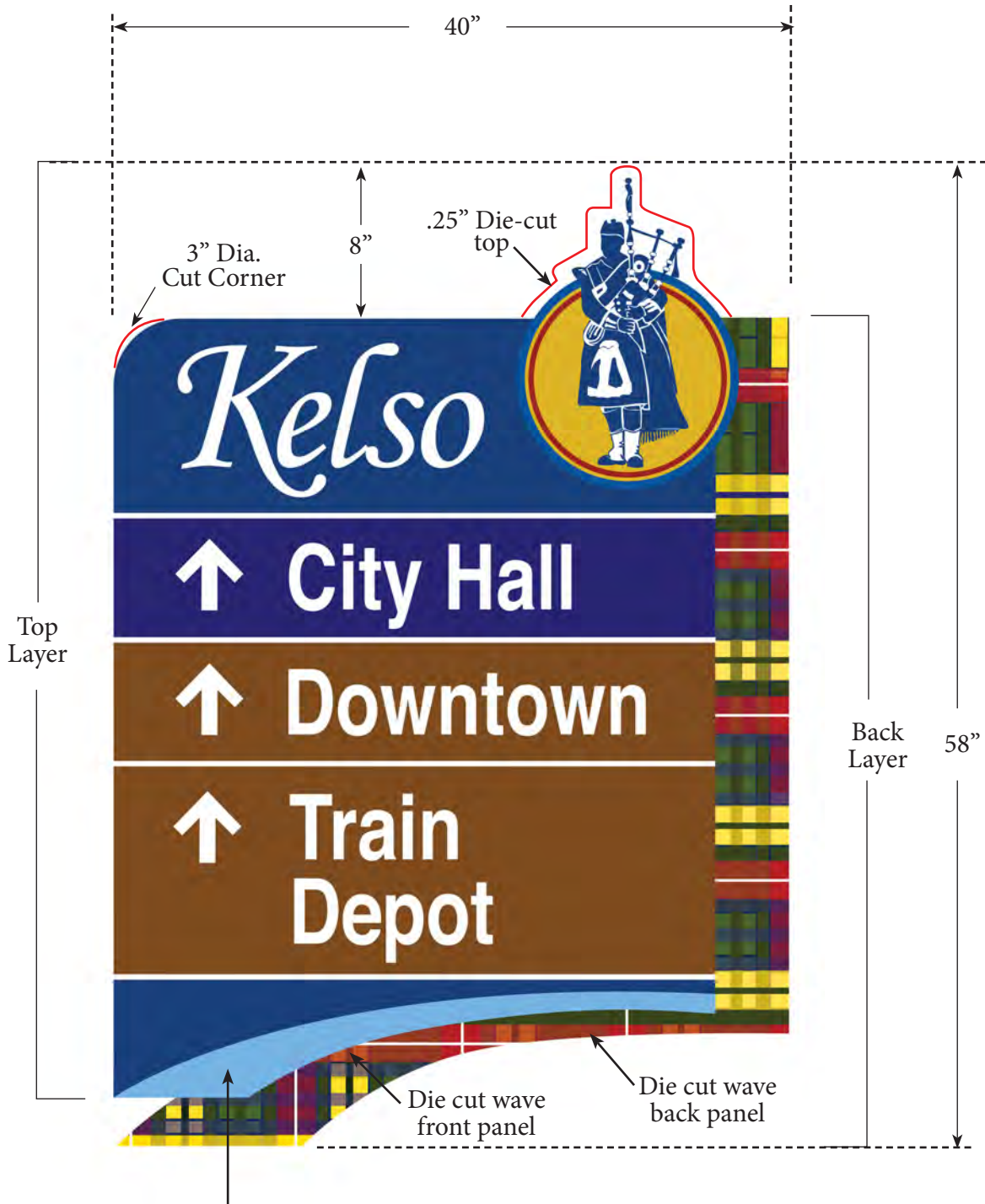
W13 & 19



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
City Hall / Downtown / Train Depot Sign Specifications
(Arrows Up)

W14 & 27



Top layer is raised off back layer
with aluminum spacer.

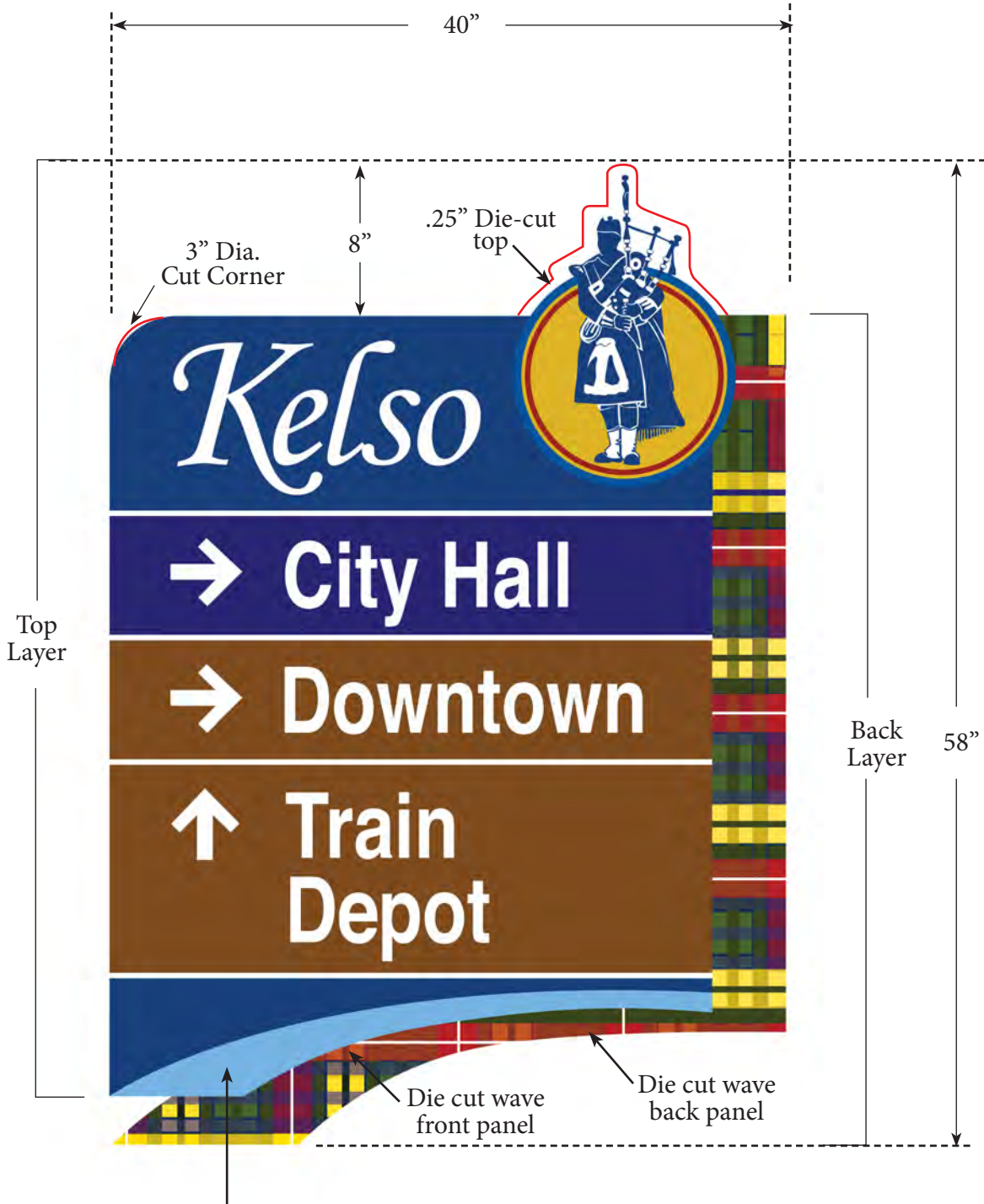
City of Kelso, WA
Kelso Historic Train Depot Sign Specifications
(Arrow Right)

W15



Top layer is raised off back layer
with aluminum spacer.

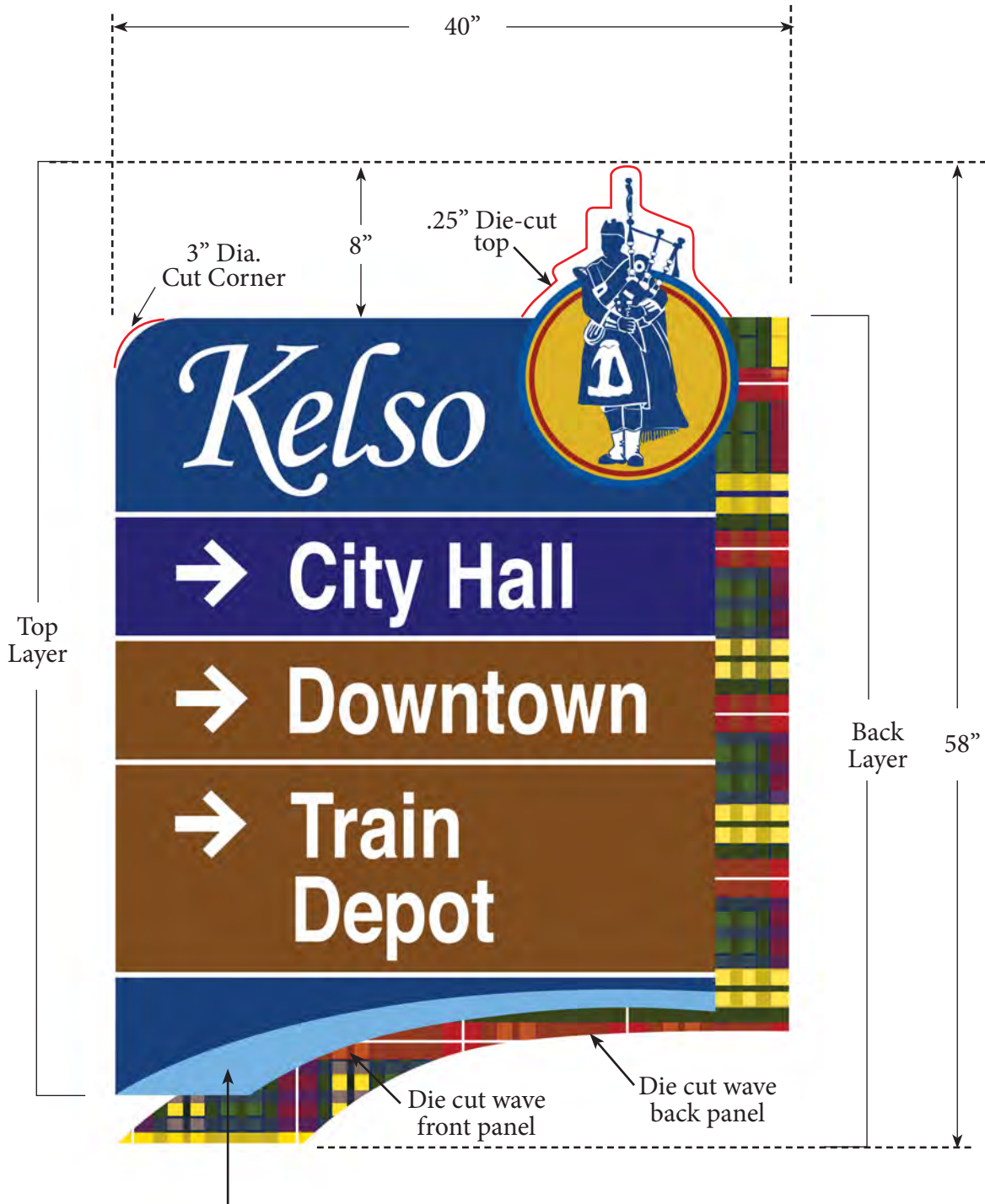
City Hall / Downtown / Train Depot Sign Specifications
(2 Arrows Right / 1 Up)



Top layer is raised off back layer with aluminum spacer.

City of Kelso, WA
City Hall / Downtown / Train Depot Sign Specifications
(Arrows Right)

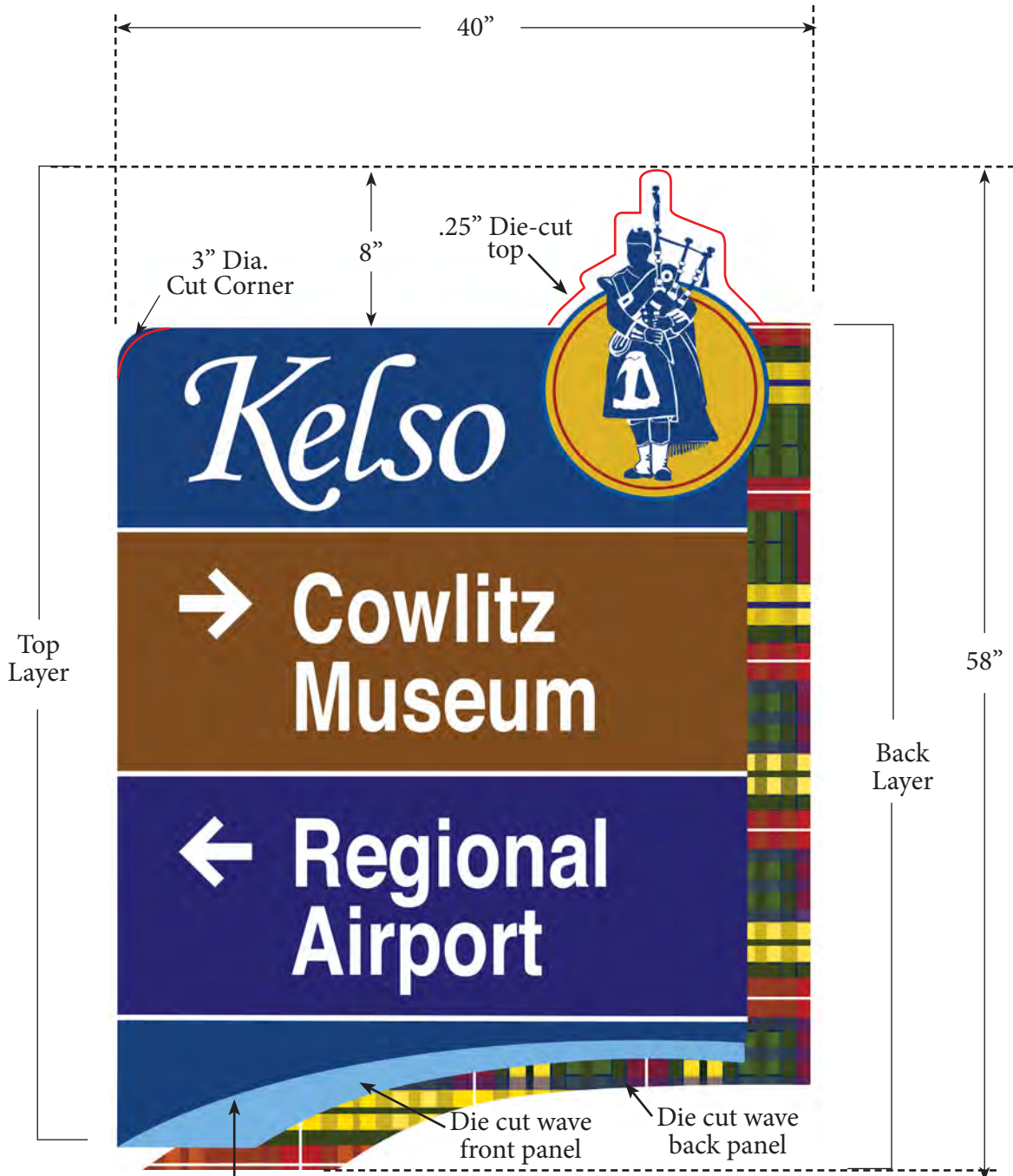
W17-18



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Cowlitz Museum / Regional Airport Sign Specifications

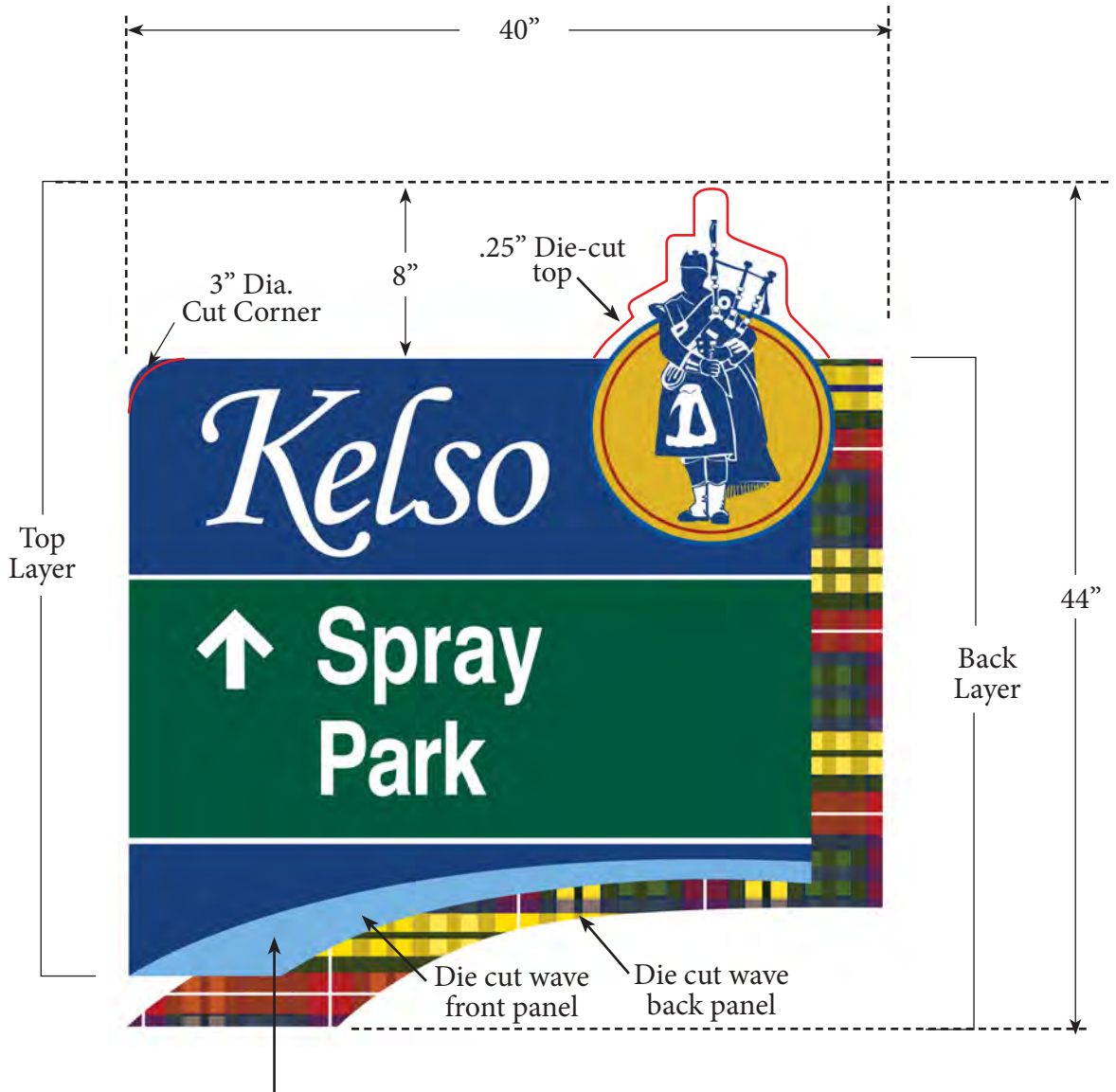
W20



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Spray Park Sign Specifications

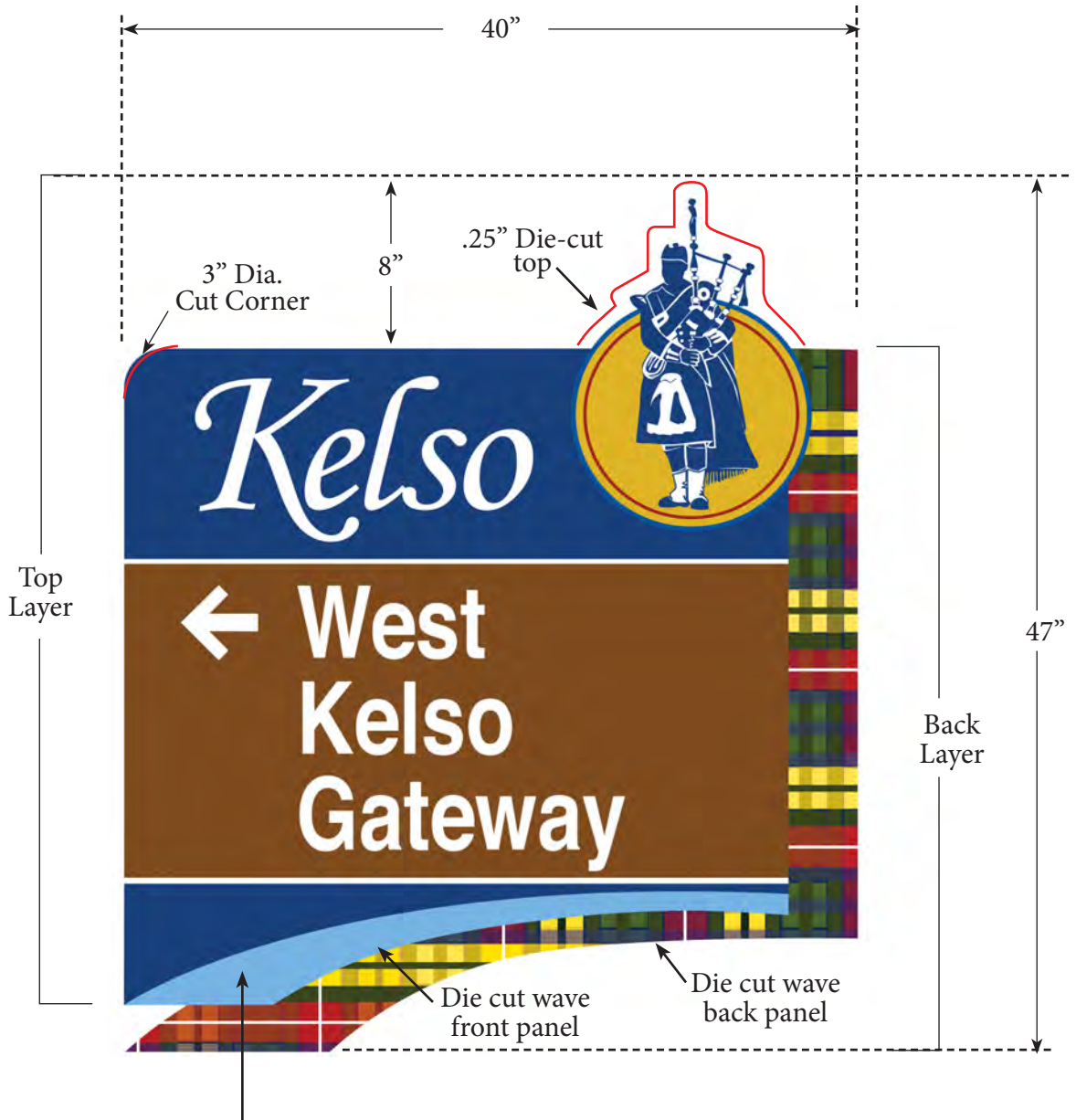
W22



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
West Kelso Gateway Sign Specifications

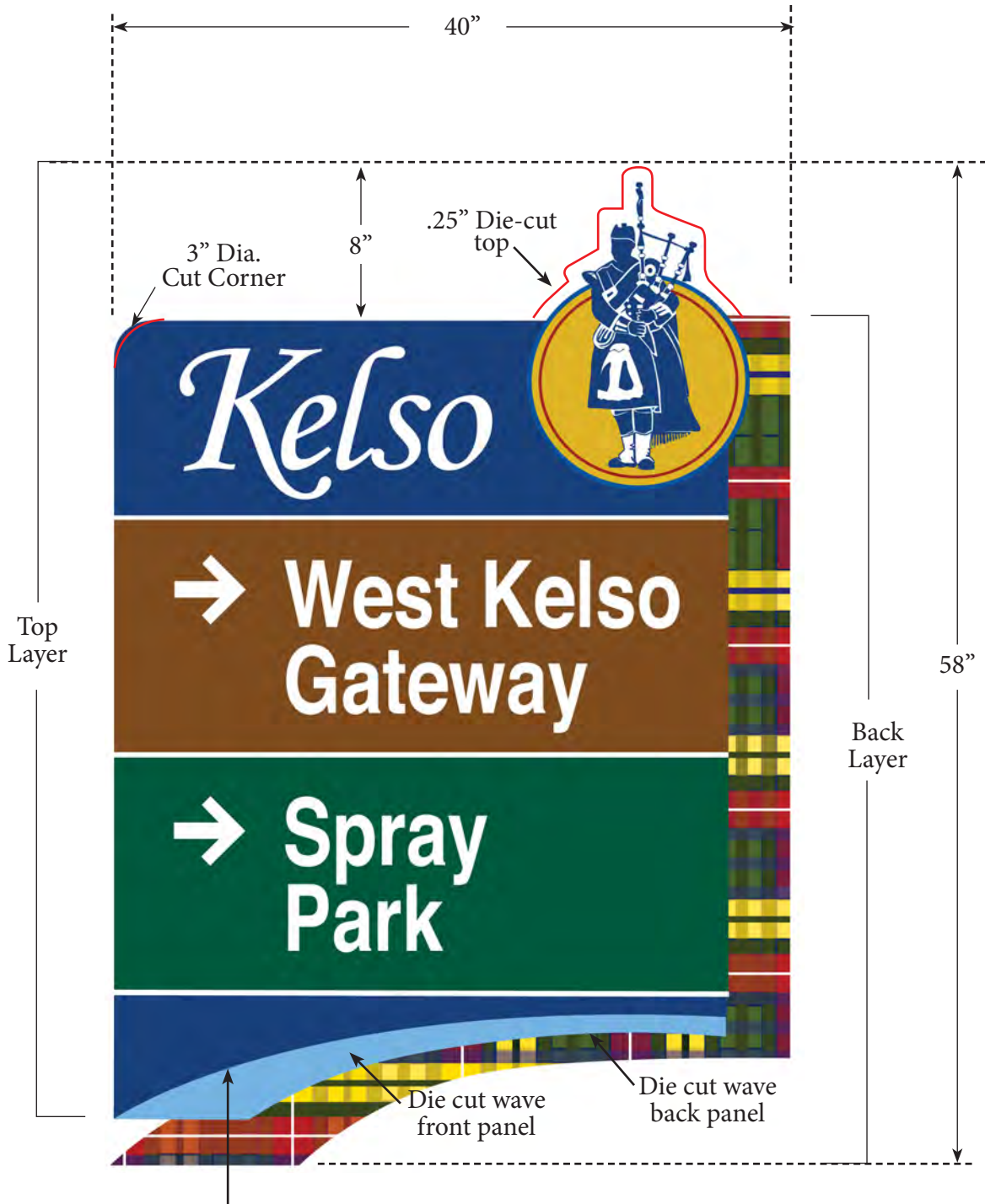
W23



Top layer is raised off back layer with aluminum spacer.

City of Kelso, WA
West Kelso / Spray Park Sign Specifications
(Arrows Right)

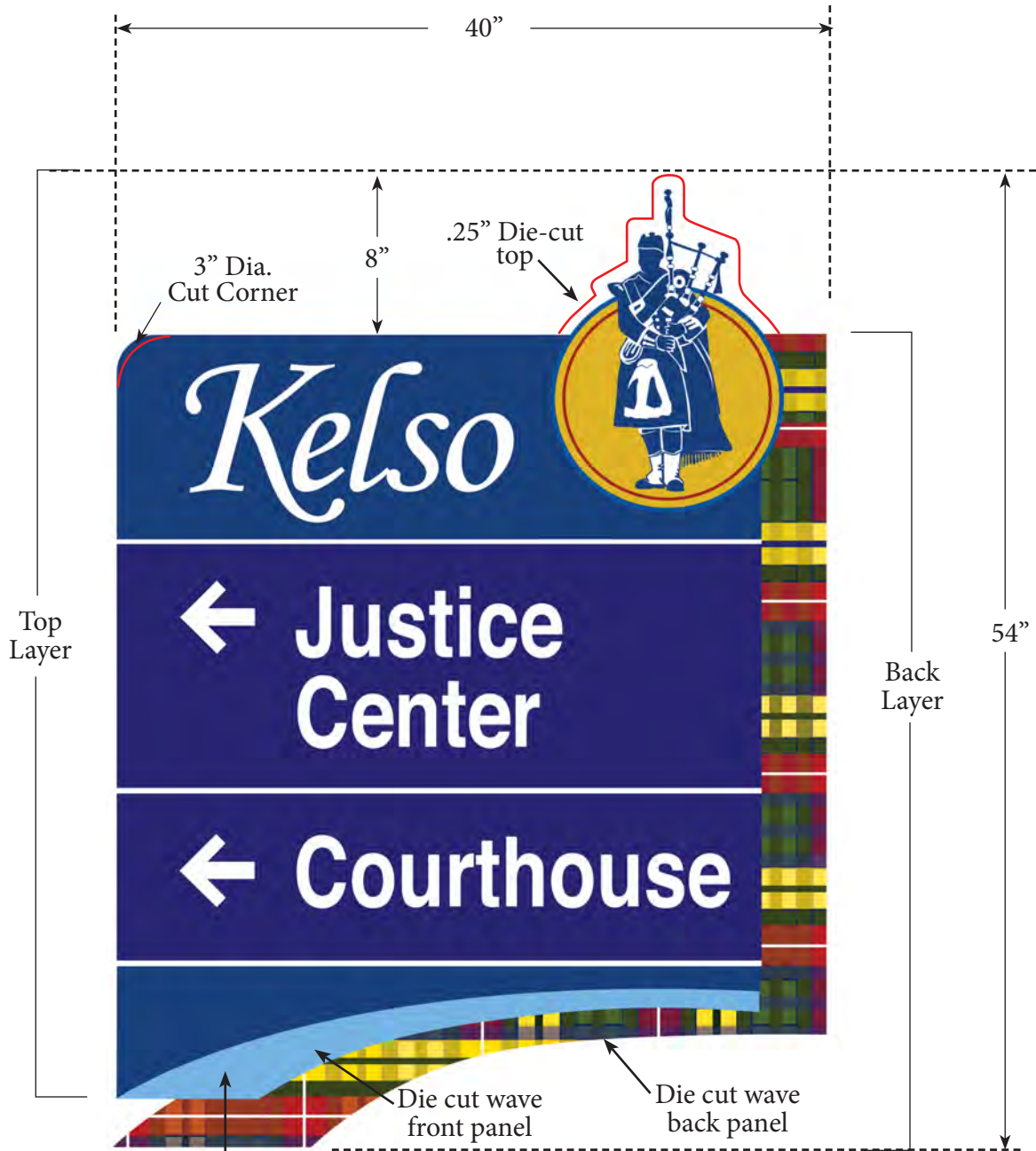
W24



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Justice Center / Courthouse Sign Specifications

W25-26



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Golf Course Sign Specifications

W28



Top layer is raised off back layer with aluminum spacer.

City of Kelso, WA
West Kelso Gateway Sign Specifications
(ArrowLeft)

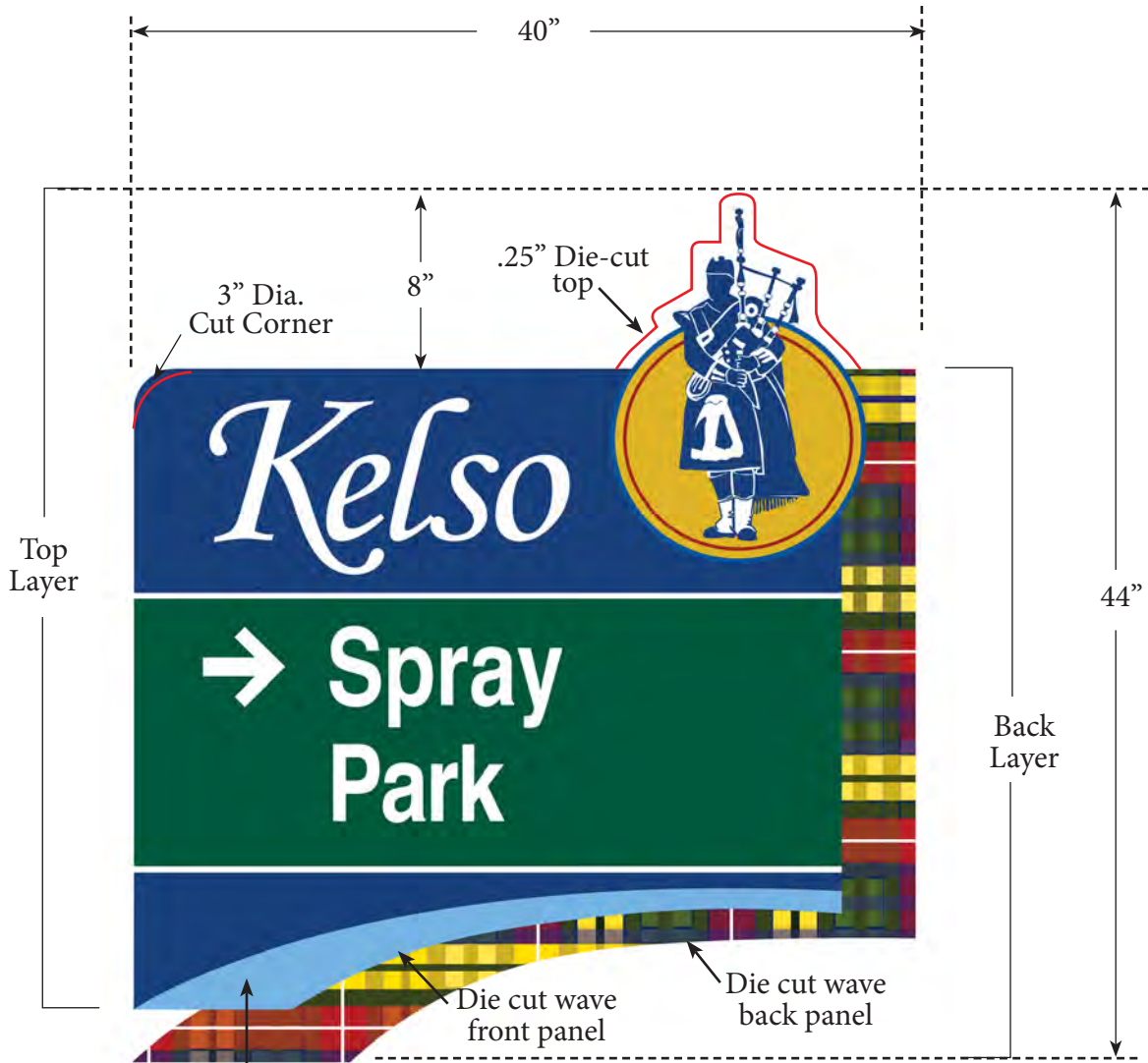
W29



Top layer is raised off back layer
with aluminum spacer.

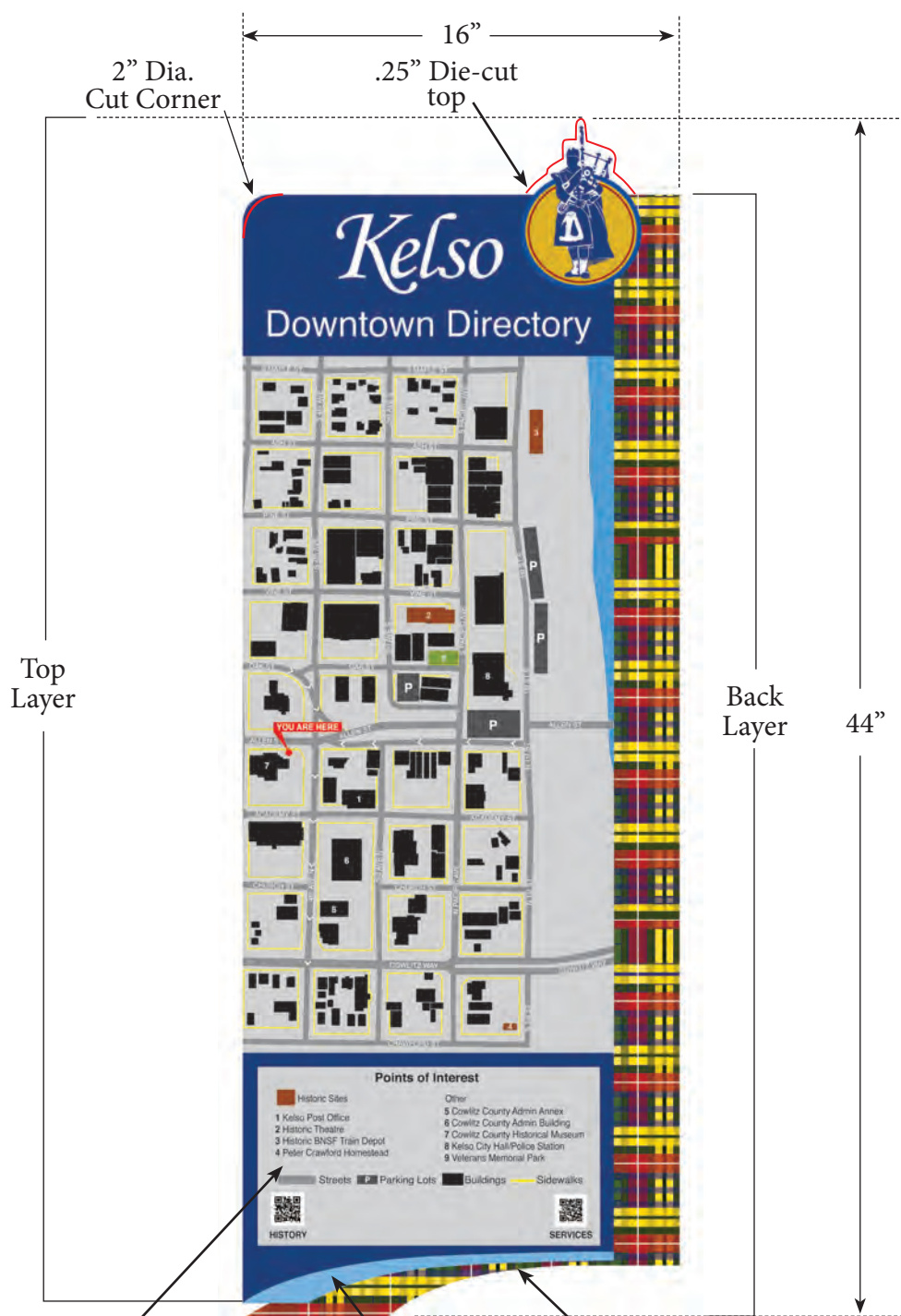
City of Kelso, WA
Spray Park Sign Specifications
(Arrow Right)

W30



**Top layer is raised off back layer
with aluminum spacer.**

City of Kelso, WA Downtown Directory Specifications (Allen St.)



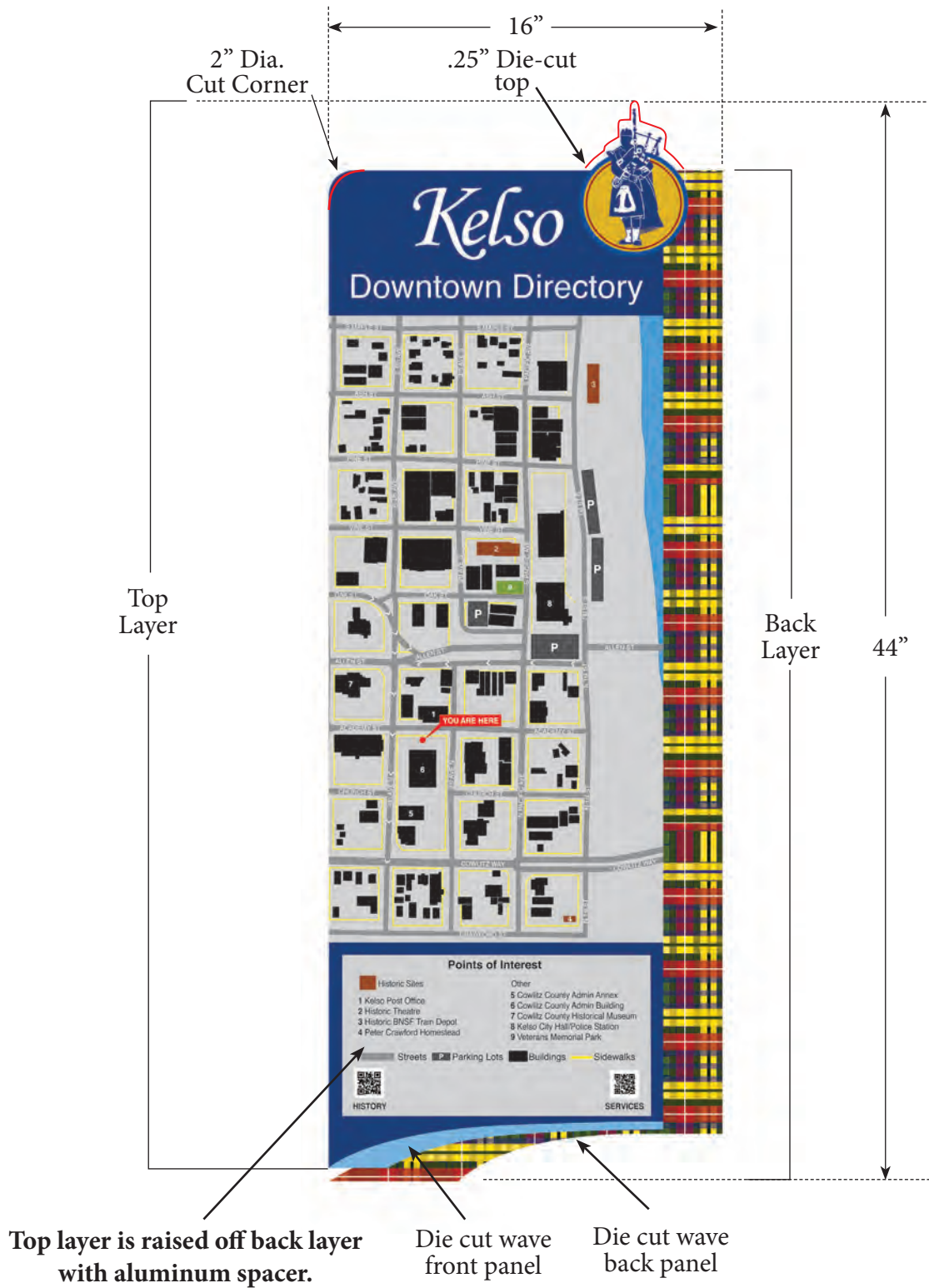
Top layer is raised off back layer with aluminum spacer.

Die cut wave front panel

Die cut wave back panel

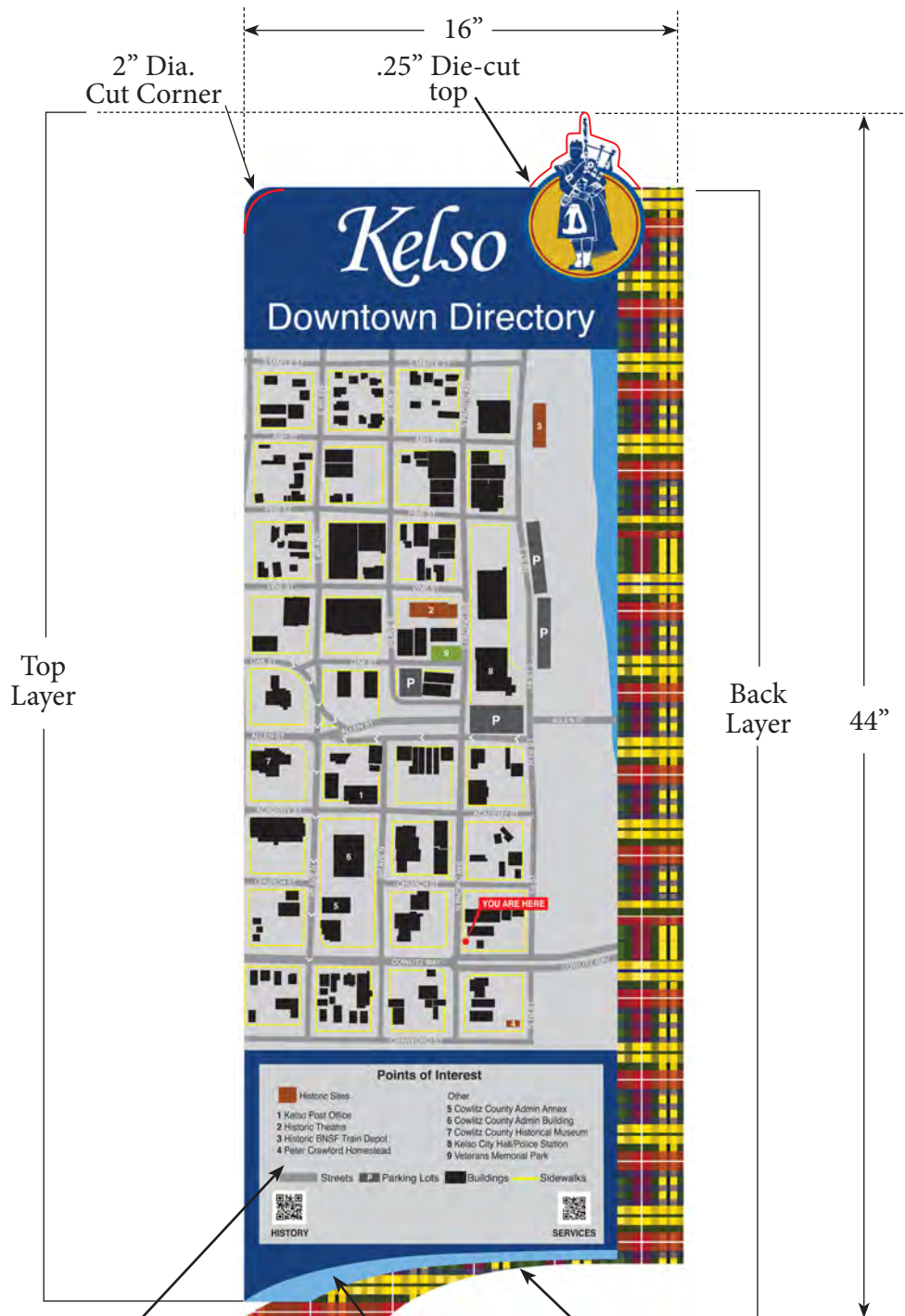
City of Kelso, WA Downtown Directory Specifications (Academey St.)

D2



City of Kelso, WA Downtown Directory Specifications (S. Pacific)

D3



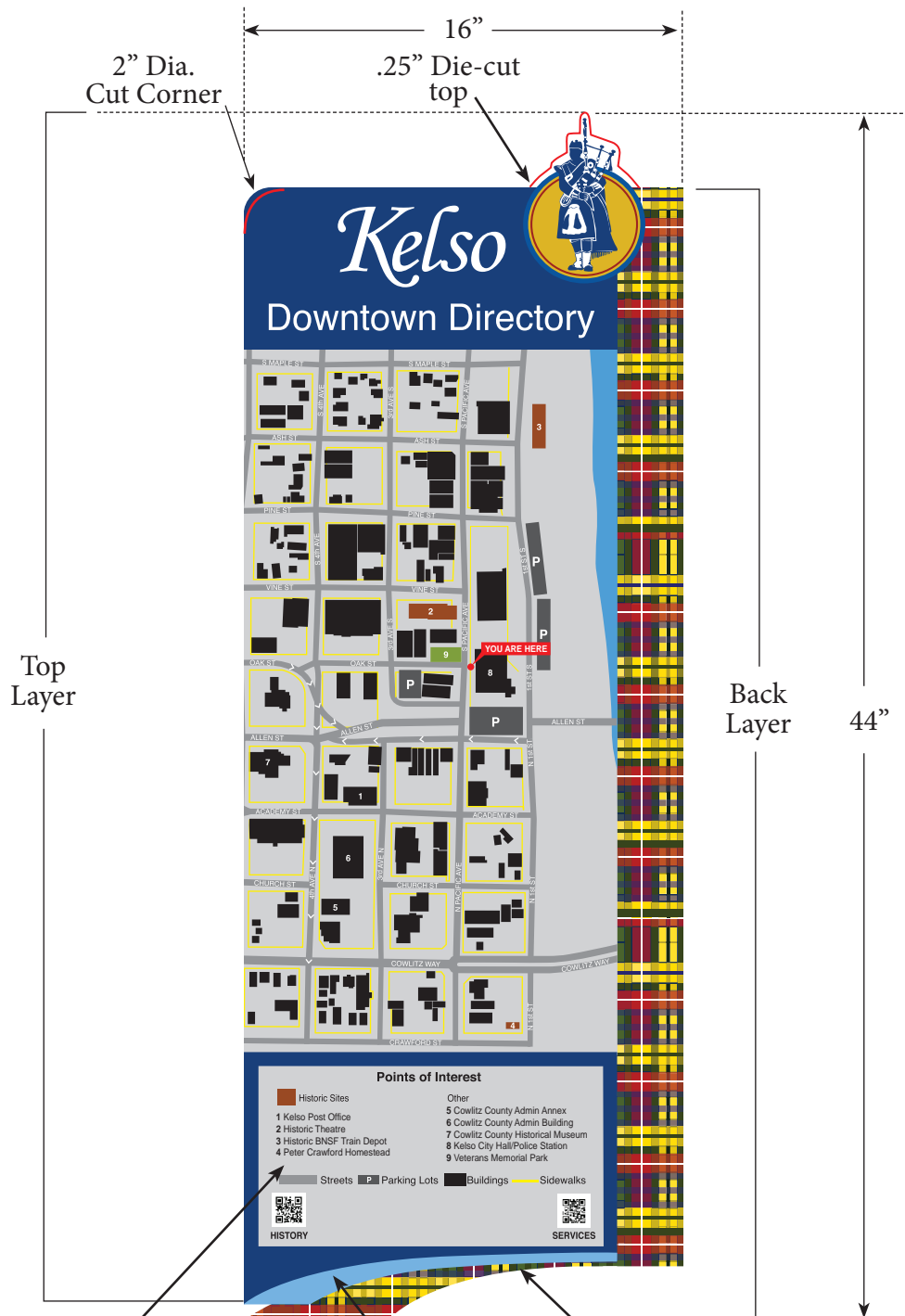
Top layer is raised off back layer with aluminum spacer.

Die cut wave front panel

Die cut wave back panel

City of Kelso, WA Downtown Directory Specifications (S. Pacific & Oak St.)

D4



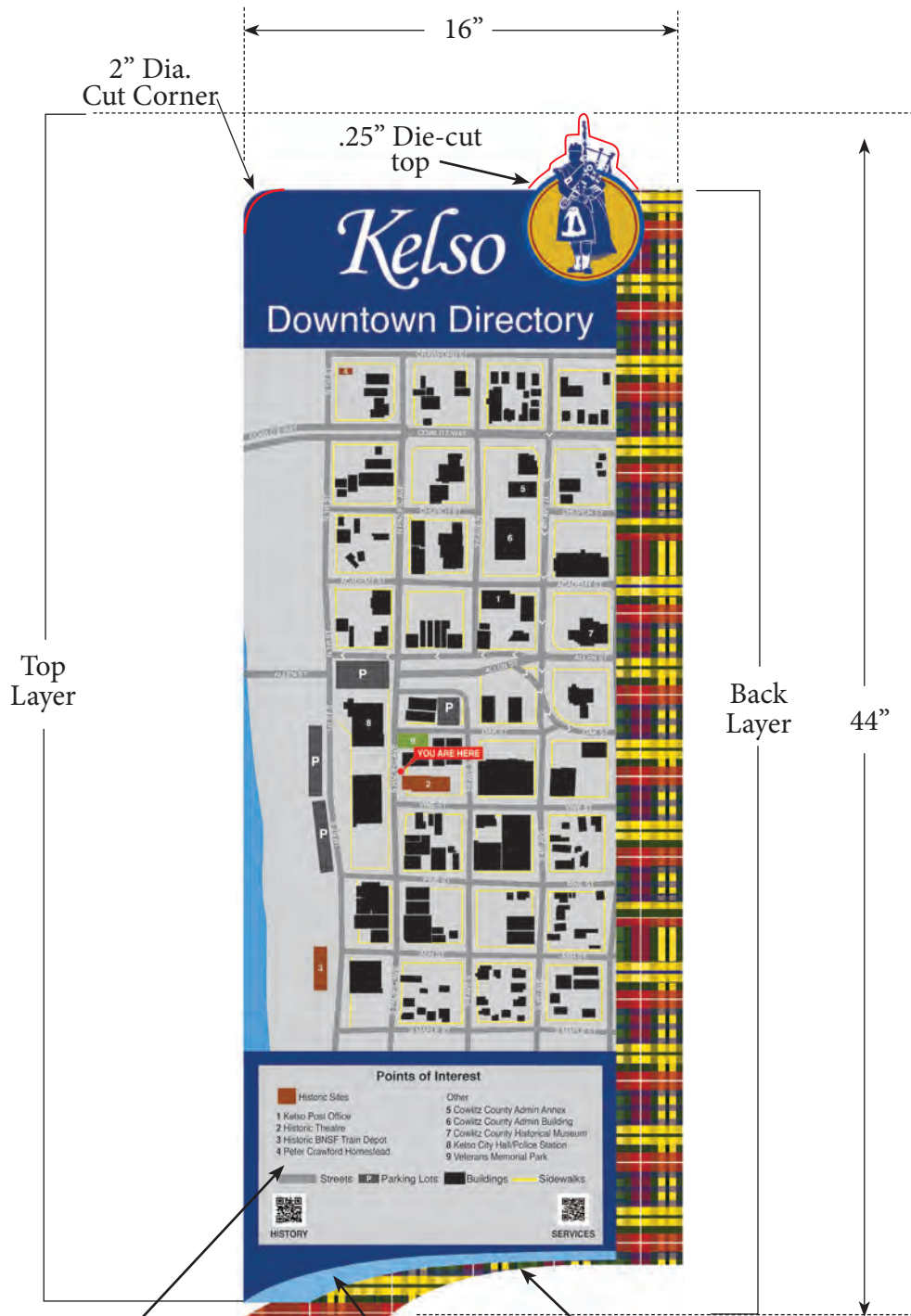
Top layer is raised off back layer with aluminum spacer.

Die cut wave front panel

Die cut wave back panel

City of Kelso, WA Downtown Directory Specifications (S. Pacific)

D5



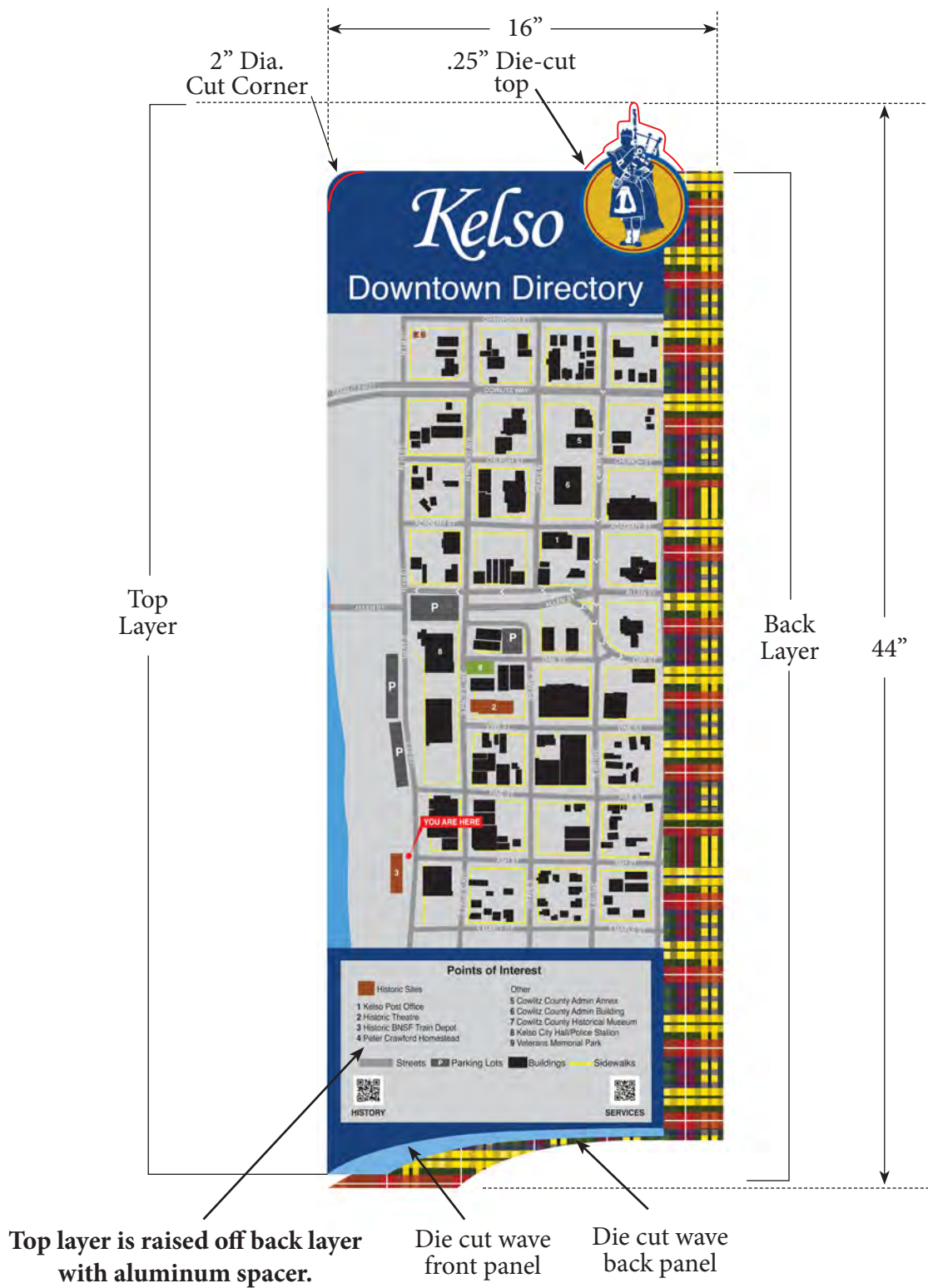
Top layer is raised off back layer with aluminum spacer.

Die cut wave front panel

Die cut wave back panel

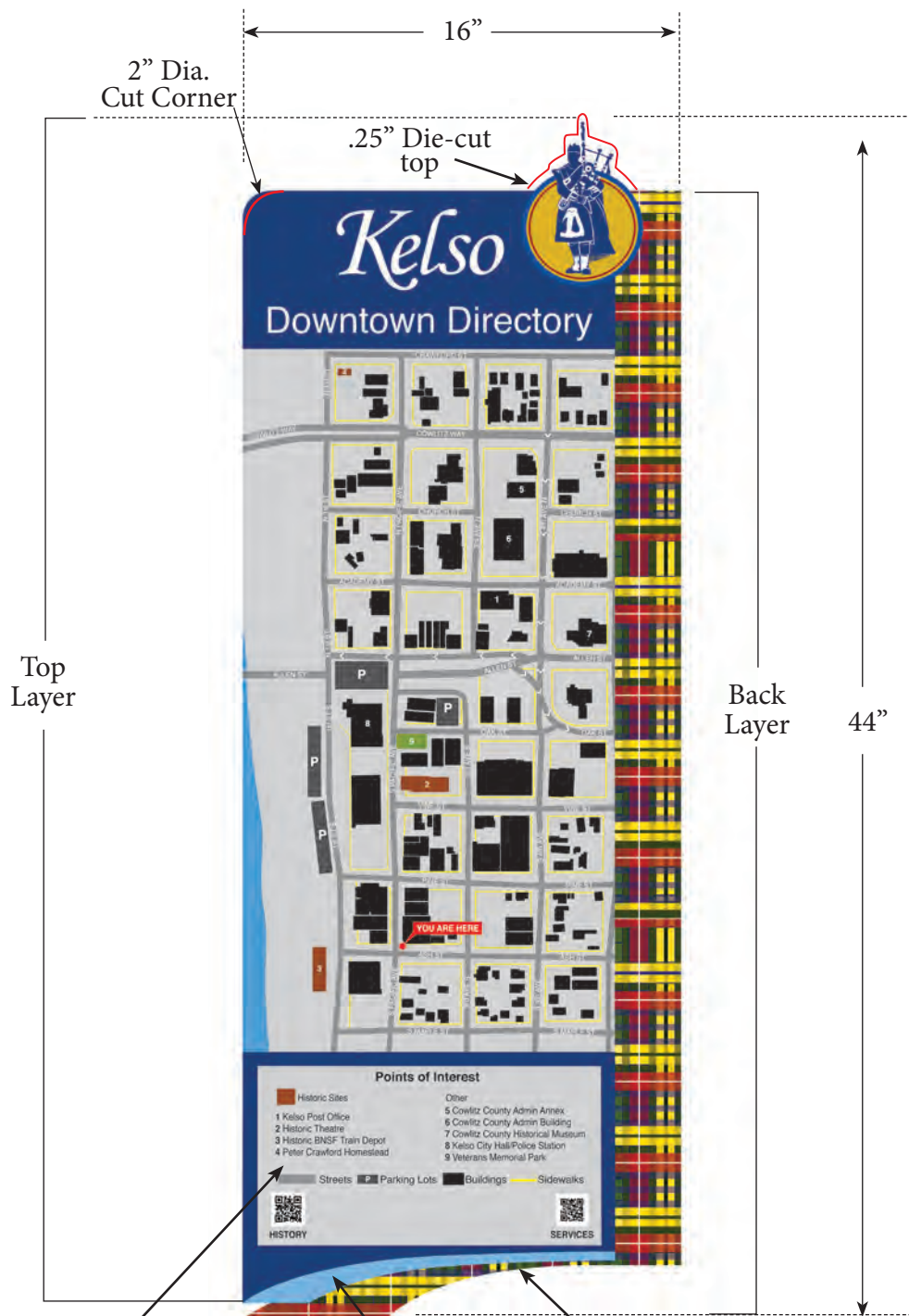
City of Kelso, WA Downtown Directory Specifications (1st St. S.)

D6



City of Kelso, WA Downtown Directory Specifications (Ash & S. Pacific)

D7



Top layer is raised off back layer with aluminum spacer.

Die cut wave front panel

Die cut wave back panel

City of Kelso, WA
West Kelso Directory Specifications
(W. Main St. #2)

D8



Top layer is raised off back layer with aluminum spacer.

Die cut wave front panel

Die cut wave back panel

City of Kelso, WA West Kelso Directory Specifications (W. Cowlitz Way)

D9



City of Kelso, WA West Kelso Directory Specifications (W. Main & Allen St. #2)



Top layer is raised off back layer with aluminum spacer.

Die cut wave front panel

Die cut wave back panel

City of Kelso, WA
West Kelso Directory Specifications
(W. Main & Allen St. #2)

D11



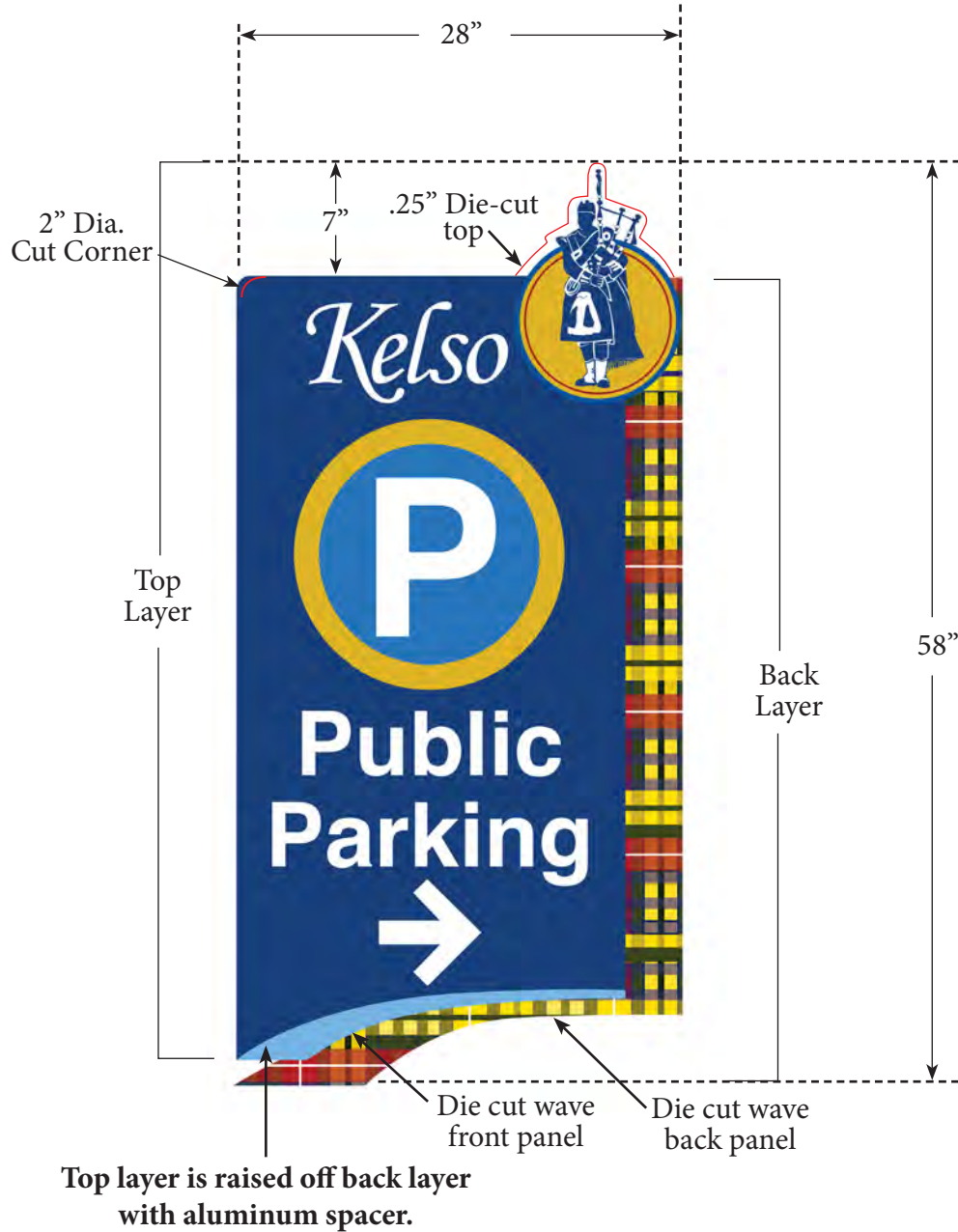
Top layer is raised off back layer with aluminum spacer.

Die cut wave front panel

Die cut wave back panel

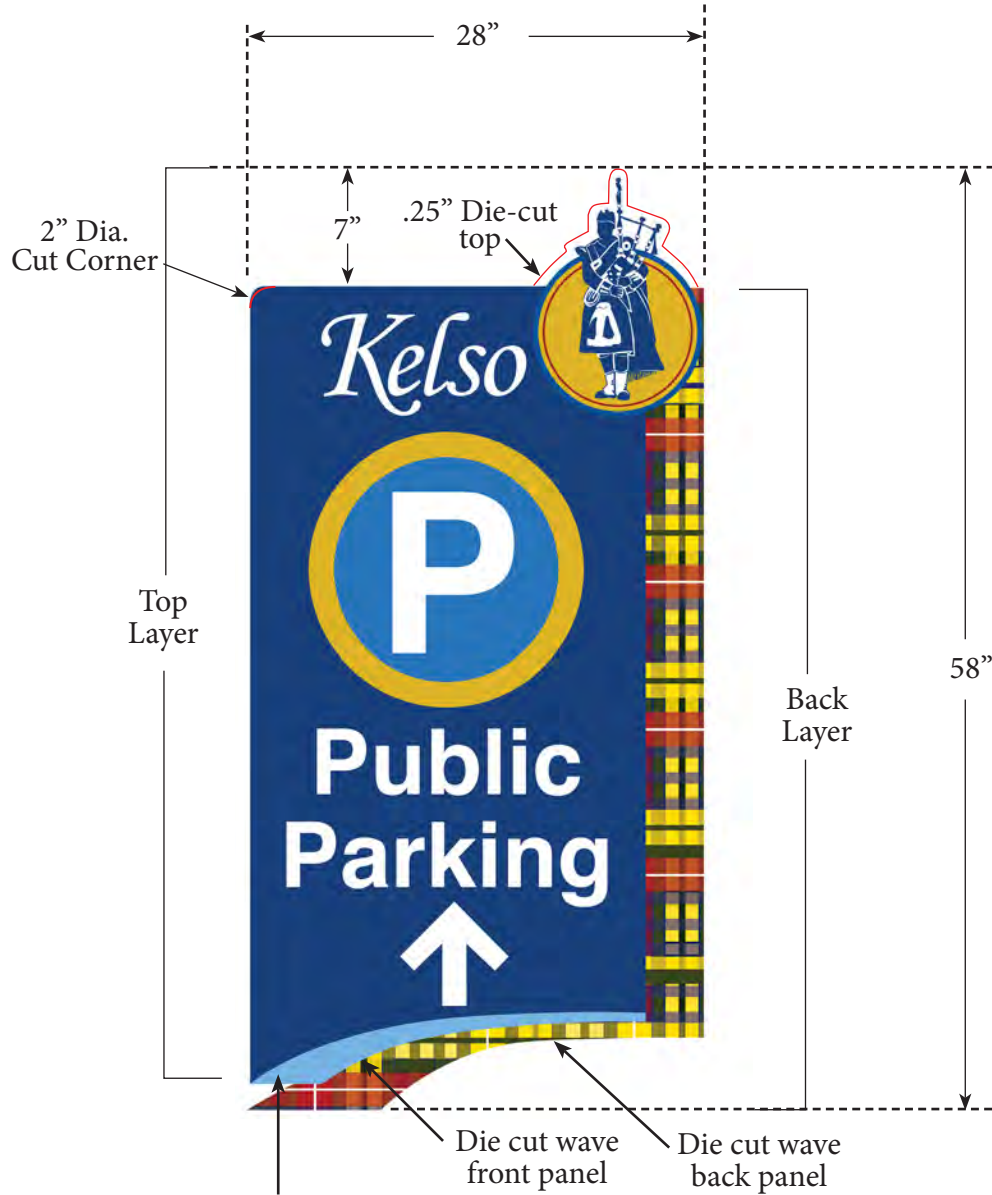
City of Kelso, WA
Public Parking Sign Specifications
(Arrow Right)

P1-3



City of Kelso, WA
Public Parking Sign Specifications
(Up Right)

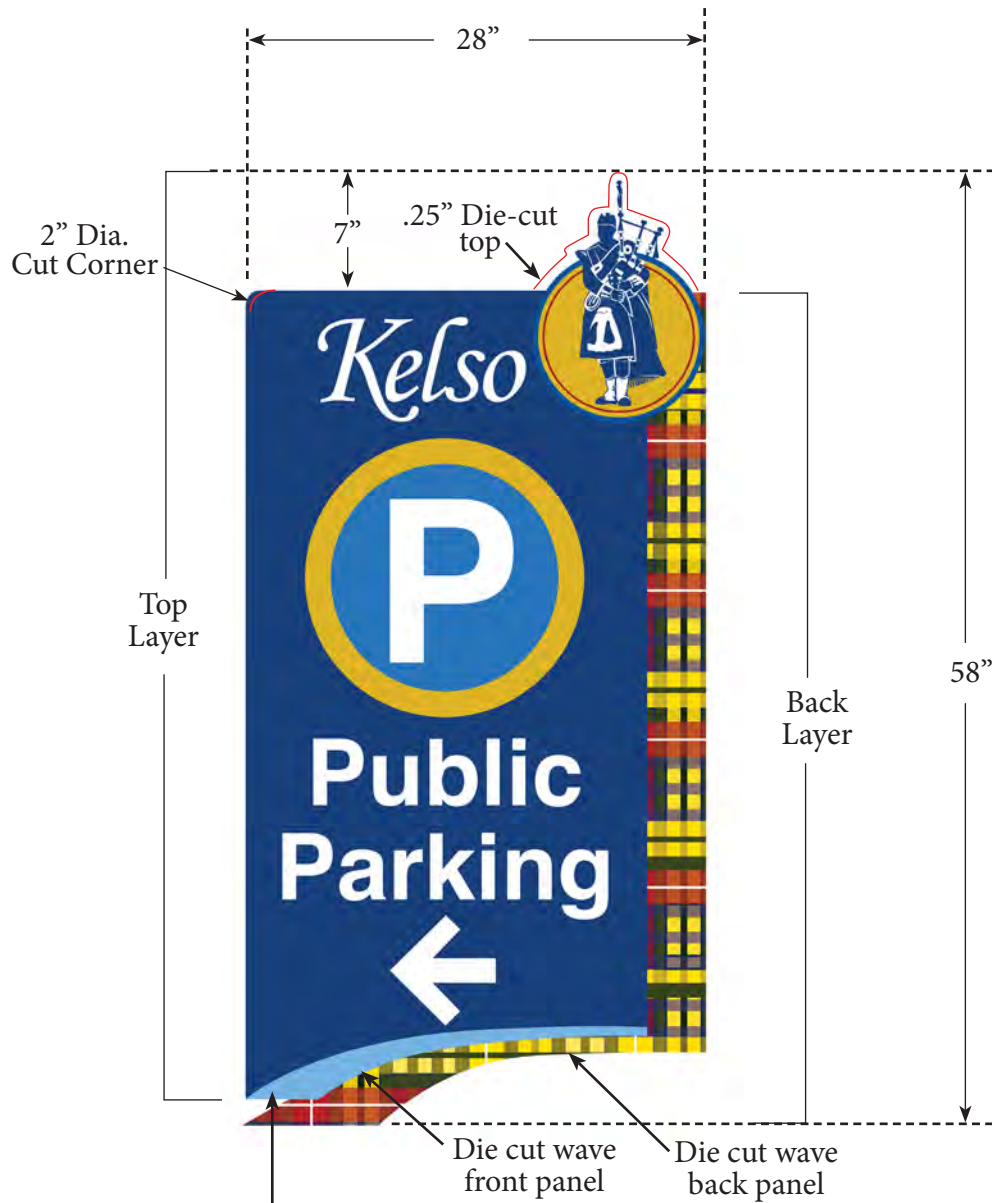
P4



**Top layer is raised off back layer
with aluminum spacer.**

City of Kelso, WA
Public Parking Sign Specifications
(Arrow Left)

P5



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Coweeman Trail Sign Specifications

T1-3 & 7



Top layer is raised off back layer
with aluminum spacer.

City of Kelso, WA
Cowlitz River Trail Sign Specifications

T4-6



Top layer is raised off back layer with aluminum spacer.

Traffic Safety and Security Division

3M™ Advanced Engineer Grade Prismatic Sheeting

Series 7930 with Pressure Sensitive Adhesive

Product Bulletin 7930 – US
February 2016

Description

3M™ Advanced Engineer Grade Prismatic Sheeting Series 7930 meets the ASTM D4956 Type I standard, and is a non-metalized microprismatic reflective sheeting designed for production of retroreflective commercial signs, non-critical traffic control signs that are exposed vertically in service, as well as pressure sensitive stickers. Micro seal technology gives Series 7930 a more uniform visual appearance compared to its conventional prismatic counterparts and a whiter base color compared to beaded sheeting. Series 7930 can be readily identified by the integral product number watermark. When applied to properly prepared sign substrates, Series 7930 sheeting provides long-term reflectivity and durability.

Table 1. Series 7930 sheeting is available in the following colors.

Color	Product Code
White	7930
Yellow	7931
Red	7932
Orange	7934
Blue	7935
Green	7937
Brown	7939

Sign Fabrication Methods

Application

Series 7930 sheeting incorporates a pressure sensitive adhesive and should be applied to the sign substrate at room temperature 65°F (18°C) or higher by any of the methods below. If the sheeting temperature is less than 65°F (18°C), allow it to remain at 65°F – 75°F (18°C – 24°C) for at least 24 hours before application. Mechanical squeeze roll applicator – Reference Information Folder 1.4.

Hand squeeze roll applicator — Reference Information Folder 1.6.

Hand application is recommended for copy only. See Information Folder 1.5. Hand applications may result in visual irregularities that may be aesthetically objectionable to some customers. Such irregularities are more noticeable on darker colors. To obtain a close-up uniform appearance, a roll laminator must be used.

All direct applied copy and border **MUST** be cut at all panel seams and squeegeed at the joint. Squeegee used on Series 7930 must be covered with a low-friction sleeve. Change sleeve often.

Splices

Series 7930 sheeting must be butt spliced when more than one piece of sheeting is used on one piece of substrate. The sheeting pieces should not touch each other at the splice in order to prevent buckling as the sheeting may expand with extreme temperature/humidity exposure.

Double Faced Signs

The sheeting on the bottom side of a double faced sign can be damaged if rolled through a squeeze roll applicator with an unprotected steel bottom roller. The use of a semi-soft flat sheet between the steel roller and the applied sign face will provide protection from damage. A material such as a rubber mat, tag board or cardboard is recommended.

Substrates

For traffic sign use, substrates found to be most reliable and durable are properly prepared aluminum sheets and extruded aluminum street name blades. It is up to the individual customer to determine if a substrate is appropriate for its specific purpose. Users are urged to carefully evaluate all other substrates for adhesion and sign durability. Other substrates that may be satisfactory for proper application of sheeting will have the following characteristics:

- Clean
- Smooth
- Flat
- Rigid
- Dimensionally stable
- Weather resistant
- Non-porous
- High surface energy (passes water break test)

Refer to Information Folder 1.7 for surface preparation recommendations. Substrates with low surface energy may require additional preparation such as flame treatment, mechanical abrasion or use of adhesion promoters prior to sheeting application.

Series 7930 is designed primarily for applications to flat substrates but also may be suitable for simple curves, such as a pipe. Any use that requires a radius of curvature of less than five inches should also be supported by rivets or bolts. Plastic substrates are not recommended where cold shock performance is required. Sign failures caused by the substrate or improper surface preparation are not the responsibility of 3M. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's application.

Imaging

For imaged areas on white sheeting when processed according to 3M recommendations, the coefficients of retroreflection should not be less than 70% of the value for the corresponding color in Table 2. The color chromaticity and luminance shall conform to Table 3.

Screen Processing

Series 7930 may be screen processed into traffic signs before or after mounting on a sign substrate, using 3M™ Process Colors Series 880N or Series 880I. Series 880N and Series 880I process colors can be screened at 60–100°F (16–38°C) at relative humidity of 20–50%. A PE 157 screen mesh with a fill pass is recommended. Refer to Information Folder 1.8 for details. Clear coating is not required or recommended. Use of other process colors series is not recommended. Care should be taken to avoid flexing Series 7930 sheeting faces after screening to minimize the possibility of cracking from improper handling techniques.

Digital Printing

Series 7930 is compatible with the 3M 8800 series UV inkjet inks printed by Durst Rho 161TS & Rho 162TS printers. Series 7930 is also compatible with the 3M 8900 series UV inkjet inks printed by an EFI H1625-RS printer. Conformance to ASTM D4956 requirements for Type I sheeting has been established when 3M printing requirements are followed. A 3M clear overlamine film must be used to finish the sign face. Regional requirements might vary. Please contact your 3M Technical Service for further information on compatible overlay films. Series 7930 is compatible with select latex and solvent ink jet inks and printers. Please contact 3M Technical Service for more information on compatible systems and inks. Series 7930 is not recommended for thermal transfer printing.

Cutting and Matching

Series 7930 may be cut into letters and shapes for direct applied copy. Sealing cut edges of Series 7930 sheeting is not required.

Plotter Cutting

Users are encouraged to evaluate cutting procedures for their own equipment and shop conditions, using typical beaded Engineer Grade settings. A slight increase in down force and knife depth may be needed.

Premasking/Prespacing

1. Premasked Markings: Use Application Tape SCPM-3.
2. Prespaced Markings: Use Prespacing Tape SCPS-2 or Application Tape SCPM-3.

Other Cutting Methods

Series 7930 may be hand cut or die cut one sheet at a time, and band sawed or guillotined in stacks. Cutting equipment such as guillotines and metal shears, which have pressure plates on the sheeting when cutting, may damage the sheeting. Padding the pressure plate and easing it down onto the sheets being cut will minimize the chance of damage. Maximum stack height for cutting Series 7930 sheeting is 50 sheets. Details on cutting can be found in Information Folder 1.10.

Background Matching

To optimize uniform appearance across all viewing conditions, background sheeting should be oriented in the same direction on the sign.

Fabrication Lines

The manufacture of prismatic sheeting results in lines being present in the product. Series 7930 fabrication lines may be noticeable very near to the sign, but do not affect the functional performance of the sign. See Figure 1 for an illustration of the fabrication lines.

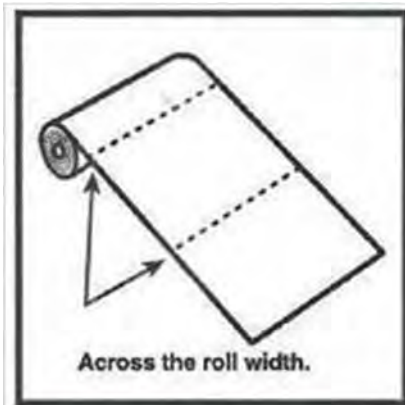


Figure 1 - Fabrication Lines

Cleaning

Signs that require cleaning should be flushed with water, then washed with a detergent solution and soft bristle brush or sponge. Avoid pressure that may damage the sign face. Flush with water following washing. Do not use solvents to clean signs. See 3M Information Folder 1.10.

Storage and Packaging

Series 7930 should be stored in a cool, dry area, preferably at 65–75°F (18–24°C) and 30–50% relative humidity and should be applied within one year of purchase. Rolls should be stored horizontally in the shipping carton. Partially used rolls should be returned to the shipping carton or suspended horizontally from a rod or pipe through the core. Unprocessed sheets should be stored flat.

Finished signs and applied blanks should be stored on edge. Processed sign faces must be protected with SCW 568 slipsheet paper. Place the glossy side of the slipsheet against the sign face. Double faced signs must have the glossy side of the slipsheet against each face of the sign.

Unmounted sign faces must be stored flat and interleaved with SCW 568 slipsheet, glossy side against the sign face.

Avoid banding, crating, or stacking signs. Package for shipment in accordance with commercially accepted standards to prevent movement and chafing. Store sign packages indoors on edges.

Panels or finished signs must remain dry during shipment and storage. If packaged signs become wet, unpack immediately and allow signs to dry. Refer to Information Folder 1.11 for instructions on packing for storage and shipment.

Installation

Nylon washers are required when twist style fasteners are used to mount the sign.

Health and Safety Information

Read all health hazard, precautionary and first aid statements found in the Safety Data Sheets, Article Information Sheets, and/or product label of chemicals prior to handling or use. To obtain SDS sheets for 3M products, go to 3M.com/SDS, or by mail, or in case of an emergency, call 1-800-364-3577.

General Performance Considerations

Minimum coefficient of retroreflection, chromaticity limits, and daytime luminance factor (Y%) for Series 7930 are given in Table 2 and Table 3, respectively.

Durability Considerations

When 3M's system of matched component materials (Table 4) are used, depending upon the substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions, and maintenance, Series 7930 can be expected to provide satisfactory performance for up to seven years.

Applications other than vertical exposure on stationary objects may reduce durability. Periodic sign inspection and regular sign replacement are strongly recommended.

Exposure Considerations

Exposure to severe or unusual conditions can shorten the performance of such applications. Signs in mountainous areas that are covered by snow for prolonged periods may also have reduced durability. Atmospheric conditions in certain geographic areas may result in reduced durability.

Custom Process Colors Considerations

Custom colors may have reduced durability.

Coefficient of Retroreflection and Chromaticity

Minimum coefficient of retroreflection, chromaticity limits, and daytime luminance factor (Y%) for Series 7930 are given in Table 2 and Table 3, respectively.

Table 2. Minimum Coefficient of Retroreflection

Candelas/Foot Candle/Square Foot Candelas/Lux/Square Meter

Obs. Angle ¹	Ent Angle ²	White	Yellow	Red	Orange	Green	Blue	Brown
0.2	-4	70	50	14.0	25	9.0	4.0	1.0
0.2	+30	30	22	6.0	7.0	3.5	1.7	0.3
0.5	-4	30	25	7.5	13	4.5	2.0	0.3
0.5	+30	15	13	3.0	4.0	2.2	0.8	0.2

Reflectivity conforms to ASTM D4956-13.

¹ Observation Angle – The angle between the illumination axis and the observation axis.

² Entrance Angle – The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

Table 3. CIE Chromaticity Coordinate Limits

Color									Reflectance Limit (Y) Color	
	x	y	x	y	x	y	x	y	Min	Max
White	.303	.300	.368	.366	.340	.393	.274	.329	27.0	
Yellow	.498	.412	.557	.442	.479	.520	.438	.472	15.0	45.0
Red	.648	.351	.735	.265	.629	.281	.565	.346	2.5	15.0
Orange	.558	.352	.636	.364	.570	.429	.506	.404	10.0	30.0
Blue	.140	.035	.244	.210	.190	.255	.065	.216	1.0	10.0
Green	.026	.399	.166	.364	.286	.446	.207	.771	3.0	12.0
Brown	.430	.340	.610	.390	.550	.450	.430	.390	1.0	9.0

Table 4. System of Matched Component Materials

Matched Components	
Process Color	Series 880N or Series 880I
UV Inkjet Inks	8800UV, 8900UV
Slipsheet	SCW 568
Prespacing Tape	SCPS-2
Premasking Tape	SCPM-3
Transfer Tape	TPM-5

Additional General Performance Considerations for Orange

Advanced Engineer Grade Prismatic Sheeting Orange 7934 can be expected to provide satisfactory performance for up to three years when processed with 3M's system of matched components listed in Table 4, depending upon climatic conditions of the installation. The user must determine the suitability of any sign substrate for its intended use. Applications to unprimed, excessively rough or non-weather-resistant surfaces, or exposure to severe or unusual conditions can shorten the durability of such applications.

3M Basic Product Warranty

3M™ Advanced Engineer Grade Prismatic Sheeting Series 7930 ("Product") is warranted ("Basic Warranty") to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this product bulletin. If the Product is proven not to have met the Basic Warranty on its shipment date, then a buyer's exclusive remedy, and 3M's sole obligation, at 3M's option, will be refund or replacement of the Product.

Limitation of Liability and Remedies

3M WILL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO A BUYER FOR DIRECT (other than the applicable Limited Remedy stated above), SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, LOSS OF PROFITS) IN ANY WAY RELATED TO A PRODUCT OR THIS PRODUCT BULLETIN, REGARDLESS OF THE LEGAL OR EQUITABLE THEORY ON WHICH SUCH DAMAGES ARE SOUGHT.

Literature Reference

Product Bulletin 880I	3M™ Process Color Series 880I
Product Bulletin 880N	3M™ Process Color Series 880N
Information Folder 1.4	Instructions for Squeeze Roll Applicator
Information Folder 1.5	Hand Application Instructions
Information Folder 1.6	Instructions for Hand Squeeze Roll Applicator
Information Folder 1.7	Sign Base Surface Preparation
Information Folder 1.8	Process Color Instructions
Information Folder 1.10	Cutting, Matching, Premasking, and Prespacing Instructions
Information Folder 1.11	Sign Maintenance Management

For Information or Assistance

Call: 1-800-553-1380

In Canada Call:

1-800-265-1840

Internet:

www.3M.com/roadwaysafety

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All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, or conditions express or implied. Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct, special or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his/her intended use, and user assumes all risk and liability whatsoever in connection therewith. Statements or recommendations not contained herein shall have no force or effect unless in an agreement signed by officers of seller and manufacturer.



Traffic Safety and Security Division

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Web 3M.com/roadwaysafety

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Traffic Safety and Security Division

3M™ Piezo Inkjet Series 8900UV Ink

Product Bulletin 8900UV
November 2016

Replaces PB 8900UV dated February 2016

Description

3M™ Piezo Inkjet Series 8900UV Ink is designed as part of 3M's system of matched components for application with EFI H1625-RS Wide Format Inkjet Printer onto 3M High Intensity Prismatic Digital Sheeting 3930DS, 3M Diamond Grade™ DG³ Prismatic Digital Sheeting 4090DS, or 3M Advanced Engineer Grade Prismatic Sheeting Series 7930. These UV-curable inks are durable, transparent, weather-resistant, and have excellent color retention when used in combination with the appropriate recommended 3M system of matched components.

Ink Color	Product Code
Blue	8903UV
Black	8905UV
Red	8912UV
Yellow	8924UV
Magenta	8915UV
Cyan	8916UV

When 3M recommended settings are used, traffic colors yellow, red, blue, green, brown, purple, and orange printed with 3M Piezo Inkjet Series 8900UV Inks onto 3M High Intensity Prismatic Digital Sheeting 3930DS and laminated with 1170 Clear Overlamine, are expected to meet the daytime color, nighttime color, and daytime luminance factor requirements stated in ASTM D4956-16, Tables 11, 13, and 2, respectively, and not less than 70% of the coefficients of retroreflection (R_A) stated in ASTM D4956-16 Table 5 (Type IV).

When 3M recommended settings are used, traffic colors yellow, red, blue, green, brown, purple, and orange printed with Piezo Inkjet Series 8900UV Inks onto Diamond Grade™ DG³ Prismatic Digital Sheeting 4090DS sheeting and laminated with 1170 Clear Overlamine, are expected to meet the daytime color, nighttime color, and daytime luminance factor requirements stated in ASTM D4956-16, Tables 11, 13, and 2, respectively, and not less than 70% of the coefficients of retroreflection (R_A) stated in ASTM D4956-16 Table 10 (Type XI).

When 3M recommended settings are used, black printed on High Intensity Prismatic Digital Sheeting 3930DS or Diamond Grade DG³ Prismatic Digital Sheeting 4090DS and laminated with 1170 Clear Overlamine, will appear sufficiently black for the intended typical traffic signage use.

Use of the 3M ElectroCut Film 1170 Clear Overlamine as an overlamine is required by 3M for traffic signs digitally imaged with Piezo Inkjet Series 8900UV Inks in order to meet the requirements noted herein.

General Performance Considerations

The durability of 3M reflective sheeting will depend upon substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions, and maintenance. Maximum durability can be expected in applications subject to vertical exposure on stationary objects when processed and applied to properly prepared aluminum according to 3M recommendations provided in [Information Folder 1.7](#). The user must determine the suitability of any nonmetallic sign backing for its intended use. Applications to unprimed, excessively rough or non-weather-resistant surfaces, or exposure to severe or unusual conditions can shorten the performance of such applications. Signs in mountainous areas that are covered by snow for prolonged periods may also have reduced durability. Atmospheric conditions in certain geographic areas may result in reduced durability.

Important Notice: This product bulletin provides technical information only. The user must determine the suitability of the product for its required or intended use, and the user assumes all risk and liability whatsoever in connection herewith.

Disclaimer

With the exception of 3M branded products, 3M does not represent that any printer or printer accessory recommended in 3M literature will meet customer requirements, any federal, state or local regulations or any applicable safety standards. Such determination is the responsibility of the printer owner. For a buyer's convenience, 3M may provide engineering or technical information, recommendations, certifications and other information or materials relating to other company's products ("Other Information"), but 3M does not warrant Other Information, including but not limited to, its accuracy or completeness.

Environmental, Health and Safety

⚠ CAUTION: When handling any chemical products, read the manufacturers' container labels and the Safety Data Sheets (SDS) for important health, safety and environmental information. To obtain SDS sheets for 3M products, go to 3M.com/SDS, or by mail, or in case of an urgent need, call 1-800-364-3577.

When using any equipment, always follow the manufacturers' instructions for safe operation.

Printing Guidelines

Please follow the recommendations below for best results.

Selecting, Preparing & Using 3M Retroreflective Sheeting

Do not use damaged rolls of sheeting, which can result in head strikes and printer damage. Condition the sheeting, ink and overlamine for 24 hours in the same environment as the printer before using.

Printing Recommendations for Traffic Signage

Printer set-up is critical to achieve good image quality and to ensure proper sheeting processing, including UV cure dose. Please follow the printer setting recommendations provided during printer installation by your 3M Technical Service representative, as they are required as part of 3M's system of matched components for the production of traffic signs.

Operation and Maintenance Procedures

Printer cleanliness is very important in the production of high quality signs and graphics. Follow all operation and maintenance procedures recommended in the printer's user manual.

Application of Overlaminates

To avoid a silvering artifact (trapped air between the ink layer and overlaminates), the lamination process should be conducted using a laminator that meets the following performance considerations:

- | | |
|-------------------------------------------------------------------------------------------|----------------------------------------------|
| 1. Roll to roll laminator | 6. Speed variable from 0-10 feet per minute |
| 2. Minimum 48" wide. Maximum 65" wide | 7. One unwind shaft for printed sheeting |
| 3. Top roll heated to 150° Fahrenheit | 8. One unwind shaft for overlaminates |
| 4. Prefer pneumatically controlled tip | 9. One rewind shaft for finished product |
| 5. Rubber covered nip rolls capable of a minimum nip pressure of 7 pounds per lineal inch | 10. One rewind shaft for overlaminates liner |

Ink Shelf Life and Storage

Use inks within one year of date of manufacture. Leave the ink in the original container during both storage and use to prevent exposure to light. Light can cause the UV ink to cure prematurely and damage the printer. Store at temperatures between 32° to 80° F.

Literature Reference

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

PB 3930DS	3M™ High Intensity Prismatic Digital Sheeting 3930DS
PB 4090DS	3M™ Diamond Grade™ DG³ Prismatic Digital Sheeting 4090DS
PB 7930	3M™ Advanced Engineer Grade Prismatic Sheeting Series 7930
PB 1170	3M™ ElectroCut™ Film Series 1170
IF 1.7	3M™ Reflective Sheeting Sign Base Surface Preparation
IF 1.11	3M™ Reflective Sheeting Sign Maintenance Management

Warranty Information

3M Basic Product Warranty

3M™ Piezo Inkjet Series 8900UV Ink ("Product") is warranted ("Basic Warranty") to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this product bulletin. If the Product is proven not to have met the Basic Warranty on its shipment date, then a buyer's exclusive remedy, and 3M's sole obligation, at 3M's option, will be refund or replacement of the Product.

3M MCS™ Warranty, MCS Warranty for Traffic, and Limited Remedy

For the MCS Warranty, MCS Warranty for Traffic, and limited remedies applicable to the Product, refer to the 3M™ Digitally-Imaged Sign Warranty Bulletin.

Limitations of Liability

3M WILL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO A BUYER FOR DIRECT (other than the applicable Limited Remedy previously stated), SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, LOSS OF PROFITS) IN ANY WAY RELATED TO A PRODUCT OR THIS PRODUCT BULLETIN, REGARDLESS OF THE LEGAL OR EQUITABLE THEORY ON WHICH SUCH DAMAGES ARE SOUGHT.

ASTM Test Methods are available from ASTM International, West Conshohoken, PA.

For Information or Assistance

Call: 1-800-553-1380

In Canada Call:

1-800-265-1840

Internet:

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Important Notice

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, or conditions express or implied. Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct, special or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his/her intended use, and user assumes all risk and liability whatsoever in connection therewith. Statements or recommendations not contained herein shall have no force or effect unless in an agreement signed by officers of seller and manufacturer.



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3M Process Color

Series 880I

Product Bulletin 880I

April 2011

Replaces PB 880 dated July 2010

Description

3M™ Process Color Series 880I is designed as part of the matched component system for application by screen processing. 3M process color series 880I can be screen processed on both applied and unapplied 3M™ Engineer Grade Prismatic Reflective Sheeting Series 3430, 3M™ High Intensity Prismatic Reflective Sheeting Series 3930, 3M™ Diamond Grade™ VIP Reflective Sheeting Series 3990 and 3M™ Diamond Grade™ DG³ Reflective Sheeting Series 4000. Please reference the appropriate product bulletin. Application to other grades or types of sheetings or surfaces is not recommended.

Colors

Series 880I process color is intended for use in the production of traffic control signs. Signs made using these materials will have a similar appearance when viewed from a vehicle in daylight or at night.

The following 880I series process colors are applied by screen processing:

880I Toner	887I Brown
882I Traffic Sign Red	888I Green
883I Blue	891I Thinner
884I Yellow	893I Violet
885I Black (Opaque)	894I Lemon Yellow
886I Orange	895I Magenta

Series 880I process colors should not be blended with any other series process colors produced by 3M or any other manufacturer. 3M assumes no responsibility for premature failure of sign face legends that have been processed with non-3M process colors.

Screen Processing

1. Equipment and Set-up

Proper color and durability is achieved by using a high grade polyester, monofilament screen fabric mesh size P.E. 157. Other size screen fabric mesh sizes do not produce satisfactory color and durability and are not recommended. Screen processing should be accomplished using the off-contact screening method. Direct contact screen printing should not be used. Refer to Information Folder 1.8 for the proper techniques of off-contact screen processing. Be sure that screens, sheeting, plus screening and drying areas are dust, dirt, and lint free.

2. Coverage

Transparent process colors screened through a P.E. 157 screen fabric will cover approximately 1200 sq. ft. per gallon. Coverage will be affected by the extent of thinning, equipment used, and application procedure.

3. Mixing and Thinning

It is important that the colors and sheetings be brought to normal ambient room temperature and humidity of the screen processing area before processing. Thinning should not be necessary, except to replace solvents lost by evaporation during processing. Thin sparingly using 3M™ Thinner of the same series as the process colors. Do not use extenders, drying agents, or other materials as they will adversely affect performance life. Do not mix with any other series of process colors or clears produced by 3M or any other manufacturers. For detailed instructions, refer to Information Folder 1.8.

4. Clear Coating

3M™ Process Color Series 880I transparent or opaque colors **need not** be clear coated.

Edge Sealing

Edge sealing is not recommended.

Air Drying

Processed sheeting for air drying must be placed on open racks to allow adequate air circulation. High volume fans must be directed through the racks. Drying times will be increased by high humidity, low temperature, poor air circulation, heavy color coat, and excessive thinning. Addition of drying agents is not recommended. Sheeting processed with Series 880I colors must be air dried for a minimum of 3 hours per color.

Oven Drying

Processed sheeting for oven dried must be placed on open racks individually with sufficient open space for unobstructed air flow.

	Flow Out Time (1)	Bake Each Color (2)	Bake Final Color (2)	Oven Temp. (3)
Series 880I	10 min. (with fans)	30 min.	30 min.	105° ± 5°F (41° ± 3°C)

1. Before placing in the oven, rack individually to permit proper flow out of color.
2. Excessive baking can deaden adhesive.
3. Oven must provide horizontal air flow.

Conveyor Drying

Signs to be dried must be placed to allow unobstructed air flow. The conveyor speed must be able to be adjusted to meet the requirements for flow-out times and heat. If immediate packaging is planned, a cooling zone capable of cooling the sign faces to room temperature of 65°-75°F (18°-24°C) is needed. Typically, the cooling zone should be the same length as the heating zone. The temperatures stated are at the sign face and not the oven temperatures. (See Table 1).

Table 1

Series 880N		
Flow-Out Time	Between Colors	Final Color
30 seconds	2 minutes @ 185°F (65°C)	2 minutes @ 185°F (65°C)

Slipsheeting and Packaging

3M™ screen processed signs must be protected with SCW 568 Slipsheet Paper. Place the glossy side of the slipsheeting against the sign face and pad the face with closed cell packaging foam. Double faced signs must have the glossy side of the slipsheet against each face of the sign.

Unmounted screened faces must be stored flat and interleaved with SCW 568 slipsheet, glossy side against the sign face. Packages of finished sign faces must include sufficient nylon washers for mounting.

Storage

Series 880I process color should be stored at general warehouse storage (16°C/60°F to 27°C/80°F). The color has a shelf life of 12 months from customer receipt.

Troubleshooting Tips

The following troubleshooting tips are suggestions to minimize the potential for cracking of sheeting after screening with Series 880I process colors:

1. Screen applied sheets rather than unapplied sheets.
2. Use piggy-back box fans to provide air flow through entire drying rack. Have these fans running from the time the first sheet or sign is racked until 3 hours after the last sheet or sign is racked.
3. When drying unapplied sheets, use a smooth cardboard underliner on the drying rack shelves.
4. Avoid flexing sheeting when color is wet.
5. Avoid adding excessive thinner to the color.
6. Use every other shelf on drying racks.
7. Avoid use of solvents when cleaning sheeting prior to screening. If necessary, use a tack cloth to clean sheeting.

Environmental, Health and Safety Information

Read all health hazard, precautionary and first aid statements found in the Material Safety Data Sheet, and/or product label of chemicals prior to handling or use.

Consult federal, state and local air quality regulations that may regulate or restrict product use.

General Performance Considerations

3M process colors series 880I which is processed according to 3M recommendations can be expected to provide durability for traffic sign uses comparable to that of the 3M sheeting on which they are applied, with the following exceptions: Process Color 886I Orange processed on white reflective sheeting will provide 3 year durability; 894I Lemon Yellow and 895I Magenta will provide 5 year durability; 893I Violet and 887I Brown will provide 7 year durability. Durability will be substantially reduced by toning the colors. The durability of sheeting or screen processed sheeting exposed in any position other than vertical or near vertical may be significantly reduced. The durability statements expressed herein do not apply for the use of sheeting for vehicle markings. Contact your 3M sales representative to clarify the durability of such applications. See sheeting product bulletins for specific warranty details.

Special Color Formulation Warranty Statement

3M has developed specific colors within 3M™ Process Color Series 880I that have been evaluated for their durability (in terms of retained translucency and resistance to fade) based on actual outdoor weathering. Customers who purchase specially blended colors from 3M or who blend these colors themselves can expect that the blended colors will last as long as the component colors would last individually. Many blended process colors will be durable for periods up to 10 years. However, since blended formulations often contain individual component colors that have differing expected durability, users will experience color shifts over time. More rapid color shift will occur with special colors that contain a higher percentage of shorter durability colors. In addition, toners significantly reduce durability. For these reasons, 3M cannot make a specific durability statement for any special colors.

Literature Reference

PB 3430	3M™ Engineer Grade Prismatic Reflective Sheeting Series 3430
PB 3930	3M™ High Intensity Prismatic Reflective Sheeting
PB 3990	3M™ Diamond Grade™ VIP Reflective Sheeting Series 3990
PB 4000	3M™ Diamond Grade™ DG ³ Reflective Sheeting
IF 1.4	Instructions for Operation of Interstate Squeeze Roll Applicator
IF 1.5	Hand Application Instructions for 3M™ Reflective Sheeting and
IF 1.6	Hand Squeeze Roll Applicators
IF 1.7	Sign Base Surface Preparation for 3M™ Reflective Sheeting Application
IF 1.8	Application of 3M™ Process Color 700, 800 and 990 on 3M™ Reflective Sheatings
IF 1.11	Reflective Sheeting Sign Maintenance Management

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Important Notice

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Premium Protective Overlay Film

Series 1160

Product Bulletin 1160

December 2013

Replaces PB 1160 November 2011

Description

3M™ Premium Protective Overlay Film Series 1160 is designed as a high performance protective transparent overlay for use on signs made from 3M Traffic Safety and Security Division sheetings, films, and images. Series 1160 has been specifically developed for use over signs made from 3M™ Diamond Grade™ and High Intensity Prismatic Sheeting, and 3M's system of matched components, and is recommended for use with these materials. Many types of defacement from vandalism can be cleaned from this film to substantially restore performance and appearance of the overlaid sign. Two configurations are available:

1160: with premask

1160A: without premask

Important: *A complete understanding of these instructions is recommended before sheeting application.*

Properties

A. Color and Transparency

Series 1160 is a clear, colorless film. Application of Series 1160 to a sign fabricated using 3M's matched component systems will preserve the initial and retained minimum retroreflectance specified for the sheeting used to fabricate the sign.

B. Film

Series 1160 is a high performance fluoropolymer film that provides a barrier and resists staining from common graffiti including paints, permanent marker ink, lipstick, eggs and stickers and allows for easier clean-up.

C. Adhesive and Liner

Series 1160 utilizes a clear, transparent, and pressure sensitive adhesive and has an easily removable white paper liner.

D. Premask

To aid film handling, Series 1160 is provided with a white paper premask which is easily peeled away from the film after application. After removing the premask, reroll the sign through the laminator to ensure good adhesion.

Application**A. Use Conditions Before Overlaying Film**

1. Air and substrate temperatures should be above 60°F (16°C).
2. Signs must be clean and screen printed inks completely dry.

B. Equipment

1. Mechanical squeeze roll applicator – See Information Folder 1.4.
2. Hand squeeze roll applicator – See Information Folder 1.6.
3. A laminating roll with a hardness of 35 durometer (Shore A) is recommended to minimize tenting of Series 1160 over direct apply copy or 3M™ ElectroCut™ Film Series 1170.

NOTE: Application of 1160A Film is best accomplished using a mechanical squeeze roll applicator. Use extra care when handling this film since it is not supported with a premask.

C. Premasked Film (1160)

1. Remove the premask AFTER film application to sign by lifting edge of premask with fingernail or knife and pulling premask back over itself at a vary sharp angle using a steady, even tension.

Note: Edge trim BEFORE removing premask.

WARNING: Do not allow premask to be exposed to moisture. Premask must be removed before storage or shipment.

D. Trimming

1. Use a sharp cutting blade to trim film along edges. It may be helpful to grasp the edge of the unsupported overhanging film to create tension on that portion of the film while trimming.
2. The overhanging portion of the film on the TOP EDGE of the sign may be folded over smoothly and adhered to the back edge of the sign to minimize any water or dirt intrusion along the top edge of the sign. The backside of the sign must be properly cleaned before film is applied.

E. Additional Processing

1. DO NOT apply any inks, films, or sheetings in the form of copy or images over 1160 film since this film is designed to repel adhesion of such markings.

F. Splices

1. Creating film splices to overlay a sign is not recommended.

Packaging and Storage

- A. Store film in a cool, dry area, preferably 65- 75°F and 30-50 percent relative humidity.
 - B. Faces and signs covered with overlay film do not require slipsheeting. Follow recommendations given in Information Folder 1.11 regarding proper storage, packaging, handling, shipping, and installation.
 - C. Use within one year from date of receipt.
-

Cleaning**A. Materials**

- 1. To remove normal dirt accumulation from signs, use a soft cloth and mild detergent and water solution followed by thorough water rinse.
 - 2. To remove other contaminations such as graffiti defacement, use commercially available cleaning systems recommended for this purpose. **Important: Before using any cleaning materials, read and carefully follow product label use and safety instructions. Test the cleaner on a small area of the sign to determine its suitability and to be sure it does not cause any unwanted results or damage to the performance of the sign.** Avoid the use of formulations containing strong polar solvents such as ketones (acetone, methyl ethyl ketone) or methylene chloride (dichloro methane) and other chlorinated solvents.

A cleaner such as 3M™ Citrus Cleaner can be effective for removal of common types of defacement such as from permanent marking pens, eggs, and stickers. A solvent such as isopropyl alcohol (IPA), or a 50/50 blend of IPA and xylene can be effective in removing paints and lacquers. Commercially available cleaners can also be highly effective. Although Series 1160 is resistant to strong solvents, prolonged exposure to solvents can result in permanent sign damage.
 - 3. A pressure sensitive tape such as SCPM-3 from 3M also may be effective in removing certain paints and stickers. Simply roll or squeegee the tape firmly over the defaced area and carefully lift away the tape with the defacement from the overlay. Small amounts of residual defacement may require cleaning solutions as stated above to remove small areas that the tape method did not remove adequately. The sign needs to be completely dry for this method to be effective.
 - 4. Always use soft cloths. Do NOT use abrasive brushes, scouring pads or implements to scrape defacement from sign as these will likely damage the sign permanently.
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3M Basic Product Warranty and Limited Remedy

3M™ Premium Protective Overlay Film Series 1160 (“Product”) is warranted to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this Product Bulletin. If the Product is proven not to have met the Basic Warranty on its shipment date, then a buyer’s exclusive remedy, and 3M’s sole obligation, at 3M’s option, will be refunded or replacement of the sheeting.

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Health and Safety Information	Read all health hazard, precautionary, and first aid statements found in the Material Safety Data Sheet and/or product label of chemicals prior to handling or use.
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General Surface Testing	3M™ Premium Protective Overlay Film Series 1160, when used according to the recommendation of 3M, can be expected to provide the same effective field performance as the sheeting on which it is applied. Series 1160 is designed to enable signs to be cleaned from many common types of defacement caused by vandalism. The film does not prevent defacement but allows the sign to be cleaned in many situations using recommended and conventional cleaners such that the performance and appearance of the original sign is substantially restored. This would include the occasional removal of such markings as common household spray paints, lipstick, permanent pen, eggs, and/or promotional stickers. Use of sharp implements, abrasive devices or certain types of strong and or corrosive chemicals to either deface the sign or used against recommendations to attempt to clean the sign could result in permanent damage to the overlay film and underlying sign which could severely reduce the performance expectation of the original sign. This overlay film is not intended to provide sign protection from impact, cutting, gouging, or pulling of the overlay film from the sign or from the use of strong chemicals that may damage the film and/or the underlying sign. Use of a flame or other high heat source and other such extreme abuse of overlaid signs would very likely severely reduce or destroy the sign's effectiveness permanently.
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Literature References	Information Folder 1.4 Instructions for Operation of Squeeze Roll Applicator
	Information Folder 1.5 Hand Applications Instructions
	Information Folder 1.6 Instructions for Hand Squeeze Roll Application
	Information Folder 1.11 Storage, Maintenance & Removal Instructions

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VHB™ Tape - Specialty Tapes

Technical Data

May 2016

Product Description:

3M™ VHB™ Tapes provide the convenience and simplicity of a tape fastener and are ideal for use in many interior and exterior bonding applications. In many situations, they can replace rivets, spot welds, liquid adhesives and other permanent fasteners.

These 3M™ VHB™ Tapes are made with acrylic foam which is viscoelastic in nature. This gives the foam energy absorbing and stress relaxing properties which provides these tapes with their unique characteristics. The acrylic chemistry provides outstanding durability performance.

These tapes utilize a variety of specific foam, adhesive, color and release liner types to provide each product/family with specific features. These features can include adhesion to specific or a broad range of materials, conformability, high tensile strength, high shear and peel adhesion, resistance to plasticizer migration, and UL746C recognition. All 3M™ VHB™ Tapes have excellent durability and excellent solvent and moisture resistance.

The tapes included in this data page have unique performance features that are not typically required in most common applications. Please refer to “3M™ VHB™ Tapes” technical data sheet for applications that do not require the special features incorporated in these specialty tapes.

3M™ VHB™ Tape Products

4950 Family

This family has general purpose adhesive on both sides of firm type foam. This family is typically used on metal, glass and high surface energy plastic substrates. Available in white and black.

Tape Number	Color	Thickness in (mm)
4914	White	0.010 (0.25)
4920	White	0.015 (0.4)
4929	Black	0.025 (0.6)
4930(F)	White	0.025 (0.6)
4949	Black	0.045 (1.1)
4950	White	0.045 (1.1)
4955	White	0.080 (2.0)
4959(F)	White	0.120 (3.0)

4945 Family

This family has multi-purpose adhesive on both sides of firm foam.

Tape Number	Color	Thickness in (mm)
4945	White	0.045 (1.1)
4946	White	0.045 (1.1)

4910 Family

This family of clear tapes is excellent for applications where clear or colorless is desired. The general purpose adhesive on both sides is suitable for high surface energy substrates.

Tape Number	Color	Thickness in (mm)
4905	Clear	0.020 (0.5)
4910	Clear	0.040 (1.0)

4951 Family

This family of tapes is based around the low temperature applicable acrylic adhesive system, utilized on both firm and conformable foam types. These products are suitable for high surface energy substrates. Available in white (firm foam) and gray (conformable foam).

Tape Number	Color	Thickness in (mm)
4951	White	0.045 (1.1)
4943F	Gray	0.045 (1.1)
4957F	Gray	0.062 (1.6)

4952 Family

This family utilizes the low surface energy adhesive on a firm foam.

Tape Number	Color	Thickness in (mm)
4932	White	0.025 (0.6)
4952	White	0.045 (1.1)

4611 Family

This family has a general purpose adhesive on both sides of firm foam. This family of tapes is typically used on metal substrates, and has the added feature of high temperature resistance, making it often suitable for bonding prior to high temperature paint processing.

Tape Number	Color	Thickness in (mm)
4611	Dark Gray	0.045 (1.1)
4646	Dark Gray	0.025 (0.6)
4655	Dark Gray	0.062 (1.6)

4622 Family

This family has general purpose adhesive on the face side (the side that typically would be bonded first) and multi-purpose adhesive on the liner side (the side exposed when the release liner is removed) of a conformable foam. Available in white.

Tape Number	Color	Thickness in (mm)
4618	White	0.025 (0.6)
4622	White	0.045 (1.1)
4624	White	0.062 (1.6)

(P) or (F) after the product number designate that both a paper and film liner product version are available. [e.g. 4930 (paper liner) and 4930F (film liner)]. See page 2 for specific details.

Typical Physical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

3M™ VHB™ Tapes				Adhesive and Foam			Release Liner		
Family	Number	Color	Tape Thickness Inches (mm) Tolerance	Adhesive Type	Foam Type	Density lb/ft³ (kg/m³)	Type	Thickness Inches (mm)	Color
4950	4914	White	0.010 (0.25) ± 15%	Gen Purp	Firm	50 (800)	DK Paper	0.003 (0.08)	White (printed)
	4920	White	0.015 (0.4) ± 15%	Gen Purp	Firm	50 (800)	DK Paper	0.003 (0.08)	White (printed)
	4929	Black	0.025 (0.6) ± 15%	Gen Purp	Firm	50 (800)	Polyester	0.002 (0.05)	Clear
	4930	White	0.025 (0.6) ± 15%	Gen Purp	Firm	50 (800)	DK Paper	0.003 (0.08)	White (printed)
	4930F	White	0.025 (0.6) ± 15%	Gen Purp	Firm	50 (800)	PE Film	0.005 (0.13)	Red
	4949	Black	0.045 (1.1) ± 10%	Gen Purp	Firm	50 (800)	Polyester	0.002 (0.05)	Clear
	4950	White	0.045 (1.1) ± 10%	Gen Purp	Firm	50 (800)	DK Paper	0.003 (0.08)	White (printed)
	4955	White	0.080 (2.0) ± 10%	Gen Purp	Firm	50 (800)	Polyester	0.002 (0.05)	Clear
	4959	White	0.120 (3.0) ± 10%	Gen Purp	Firm	50 (800)	Polyester	0.002 (0.05)	Clear
	4959F	White	0.120 (3.0) ± 10%	Gen Purp	Firm	50 (800)	PE Film	0.005 (0.13)	Red
4945	4945	White	0.045 (1.1) ± 10%	Multi-Purp	Firm	50 (800)	DK Paper	0.003 (0.08)	White (printed)
	4946	White	0.045 (1.1) ± 10%	Multi-Purp	Firm	50 (800)	PE Film	0.005 (0.13)	Red (printed)
4910	4905	Clear	0.020 (0.5) ± 15%	Gen Purp	Solid	60 (960)	PE Film	0.005 (0.13)	Red (printed)
	4910	Clear	0.040 (1.0) ± 10%	Gen Purp	Solid	60 (960)	PE Film	0.005 (0.13)	Red (printed)
4951	4951	White	0.045 (1.1) ± 10%	Low Temp Appl	Firm	50 (800)	Polyester	0.002 (0.05)	Clear
	4943F	Gray	0.045 (1.1) ± 10%	Low Temp Appl	Conform	45 (720)	Polyester	0.002 (0.05)	Clear
	4957F	Gray	0.062 (1.6) ± 10%	Low Temp Appl	Conform	45 (720)	Polyester	0.002 (0.05)	Clear
4952	4932	White	0.025 (0.6) ± 15%	LSE	Firm	50 (800)	DK Paper	0.003 (0.08)	White (printed)
	4952	White	0.045 (1.1) ± 10%	LSE	Firm	50 (800)	DK Paper	0.003 (0.08)	White (printed)
4611	4611	Dk Gray	0.045 (1.1) ± 10%	Gen Purp	Firm	52 (840)	PE Film	0.005 (0.13)	Red
	4646	Dk Gray	0.025 (0.6) ± 15%	Gen Purp	Firm	52 (840)	PE Film	0.005 (0.13)	Red
	4655	Dk Gray	0.062 (1.6) ± 10%	Gen Purp	Firm	52 (840)	PE Film	0.005 (0.13)	Red
4622	4618	White	0.025 (0.6) ± 15%	Gen/Multi Purp	Conform	45 (720)	PE Film	0.004 (0.10)	Green
	4622	White	0.045 (1.1) ± 10%	Gen/Multi Purp	Conform	45 (720)	PE Film	0.004 (0.10)	Green
	4624	White	0.062 (1.6) ± 10%	Gen/Multi Purp	Conform	45 (720)	PE Film	0.004 (0.10)	Green

Available Sizes

Tape Thickness inches (mm)	Standard Length yards (meters)	Minimum Width inches (mm)	Maximum Width inches (mm)	Maximum Roll Length		
				Width 1/4" up to 3/8" (6.4mm up to 9.5mm) yards (meters)	Width >3/8" up to 1/2" (>9.5mm up to 12.7mm) yards (meters)	Width 1/2" and wider (12.7mm and wider) yards (meters)
0.010 (0.25)	72 (65.8)	0.25 (6)	48 (1219)	72 (65.8)	144 (131.7)	360 (329.2)
0.015 (0.4)	72 (65.8)	0.25 (6)	48 (1219)	144 (131.7)	175 (160.0)	360 (329.2)
0.020 (0.5)	72 (65.8)	0.25 (6)	48 (1219)	72 (65.8)	108 (98.8)	175 (160.0)
0.025 (0.6)	72 (65.8)	0.25 (6)	48 (1219)	72 (65.8)	108 (98.8)	175 (160.0)
0.040 (1.0)	36 (32.9)	0.25 (6)	48 (1219)	72 (65.8)	108 (98.8)	144 (131.7)
0.045 (1.1)	36 (32.9)	0.25 (6)	48 (1219)	72 (65.8)	108 (98.8)	144 (131.7)
0.062 (1.6)	36 (32.9)	0.25 (6)	46 (1168)	72 (65.8)	72 (65.8)	108 (98.8)
0.080 (2.3)	36 (32.9)	0.25 (6)	46 (1168)	36 (32.9)	36 (32.9)	72 (65.8)
0120 (3.0) (4959)	36 (32.9)	0.5 (13)	46 (1168)	N/A N/A	N/A N/A	36 (32.9)
0120 (3.0) (4959F)	36 (32.9)	0.25 (6)	46 (1168)	36 (32.9)	36 (32.9)	36 (32.9)

Slitting Tolerance

Standard slitting tolerance $\pm 1/32$ inch (± 0.031 inch, ± 0.79 mm).

Precision slitting with slitting tolerance of $\pm 1/64$ inch (± 0.016 in., ± 0.41 mm) is available on select products with minimum order of full web increments.

Core Size

All products are provided on a 3 inch ID Core (76.2 mm)

Converted Parts

In addition to standard and custom roll sizes available from 3M through the distribution network, 3M™ VHB™ Tapes are also available in limitless shapes and sizes through the 3M Converter network. For additional information, contact 3M Converter Markets at 1-800-223-7427 or on the web at www.3M.com/converter.

Shelf Life

All 3M™ VHB™ Tapes have a shelf life of 24 months from date of shipment when stored at 40°F to 100°F (4°C to 38°C) and 0-95% relative humidity. The optimum storage conditions are 72°F (22°C) and 50% relative humidity.

Performance of tapes is not projected to change even after shelf life expires; however, 3M does suggest that 3M™ VHB™ Tapes are used prior to the shelf life date whenever possible.

The manufacturing date is available on all 3M™ VHB™ Tape cores as the lot number. The lot number, typically a 4 digit code, is a Julian date (Y D D D). The first digit refers to the year of manufacture, the last 3 digits refer to the days after January 1. Example: A lot number of 9266 would translate to a date of manufacture of Sept. 22 (266th day of year) in 2009. On most products this is found as the 4 digits after the "9" following the product number. For tapes printed continuously around the core (e.g. 3M™ VHB™ Tape 5952 family) the lot number typically will be the string of 4 digits preceding the product number.

Special Cases:

Plasticized Vinyl – Plasticizers compounded in soft vinyl can migrate into adhesives and significantly change their performance characteristics. 3M™ VHB™ Tapes 4945 family has very good plasticizer resistance and adhesion to many vinyl formulations. Because of the wide variation in vinyl formulations, however, evaluation by the user must be conducted with the specific vinyl used to ensure that performance will be satisfactory over time. Problems related to plasticizer migration can often be predicted by accelerated aging of assembled parts at 150°F (66°C) for one week.

Typical Performance Characteristics

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

3M™ VHB™ Tapes				Dynamic Adhesion Performance		
Family	Product Number	Color	Thickness Inches	90° Peel Adhesion lb/in N/cm	Normal Tensile lb/in ² kPa	Dynamic Overlap Shear lb/in ² kPa
4950	4914	White	0.010	13 (23)	130 (900)	130 (900)
	4920	White	0.015	15 (26)	160 (1100)	100 (690)
	4929	Black	0.025	20 (35)	160 (1100)	100 (690)
	4930(F)	White	0.025	20 (35)	160 (1100)	100 (690)
	4949	Black	0.045	25 (44)	140 (970)	80 (550)
	4950	White	0.045	25 (44)	140 (970)	80 (550)
	4955	White	0.080	20 (35)	95 (660)	70 (480)
	4959(F)	White	0.062	20 (35)	75 (520)	55 (380)
4945	4945	White	0.045	25 (44)	140 (970)	80 (550)
	4946	White	0.045	25 (44)	140 (970)	80 (550)
4910	4905	Clear	0.020	12 (21)	100 (690)	70 (480)
	4910	Clear	0.040	15 (26)	100 (690)	70 (480)
4951	4951	White	0.045	18 (32)	110 (760)	80 (550)
	4943F	Gray	0.045	20 (35)	85 (590)	70 (480)
	4957F	Gray	0.062	20 (35)	75 (520)	70 (480)
4952	4932	White	0.025	20 (35)	100 (690)	100 (690)
	4952	White	0.045	25 (44)	80 (550)	80 (550)
4611	4611	Dk Gray	0.045	18 (32)	90 (620)	65 (450)
	4646	Dk Gray	0.025	15 (26)	100 (690)	80 (550)
	4655	Dk Gray	0.062	18 (32)	80 (550)	60 (410)
4622	4916	White	0.025	17 (30)	85 (590)	80 (550)
	4622	White	0.045	20 (35)	70 (480)	65 (450)
	4624	White	0.062	20 (35)	55 (380)	60 (410)



90° Peel Adhesion - Based on ASTM D3330 - To stainless steel, room temperature, jaw speed 12 in/min (304.8 mm/min). Average force to remove is measured. 72 hour dwell.



Normal Tensile (T-Block Tensile) - ASTM D-897 - To aluminum, room temperature, 1 in² (6.45 cm²), jaw speed 2 in/min (50.8 mm/min) Peak force to separate is measured. 72 hour dwell.



Dynamic Overlap Shear - ASTM D-1002 - To stainless steel, room temperature, 1 in² (6.45 cm²), jaw speed 0.5 in/min (12.7 mm/min) Peak force to separate is measured. 72 hour dwell.

3M™ VHB™ Tape - Specialty Tapes

Typical Performance Characteristics

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

3M™ VHB™ Tapes				Static Shear					Temperature Tolerance	
Family	Product Number	Color	Thickness Inches	72°F (22°C)	150°F (66°C)	200°F (93°C)	250°F (121°C)	350°F (177°C)	Short Term (Minutes, Hours) °F (°C)	Long Term (Days, Weeks) °F (°C)
4950	4914	White	0.010	1500	500	500			300 (149)	200 (93)
	4920	White	0.015	1500	500	500			300 (149)	200 (93)
	4929	Black	0.025	1500	500	500			300 (149)	200 (93)
	4930(F)	White	0.025	1500	500	500			300 (149)	200 (93)
	4949	Black	0.045	1500	500	500			300 (149)	200 (93)
	4950	White	0.045	1500	500	500			300 (149)	200 (93)
	4955	White	0.080	1500	1000	750	750	750	400 (204)	300 (149)
	4959(F)	White	0.120	1500	1000	750	750	750	400 (204)	300 (149)
4945	4945	White	0.045	1500	500	500			300 (149)	200 (93)
	4946	White	0.045	1500	500	500			300 (149)	200 (93)
4910	4905	Clear	0.020	1000	500	500			300 (149)	200 (93)
	4910	Clear	0.040	1000	500	500			300 (149)	200 (93)
4951	4951	White	0.045	1250	500	500			300 (149)	200 (93)
	4943F	Gray	0.045	1000	500	500			300 (149)	200 (93)
	4957F	Gray	0.062	1000	500	500			300 (149)	200 (93)
4952	4932	White	0.025	1500	500				200 (93)	160 (71)
	4952	White	0.045	1500	500				200 (93)	160 (71)
4611	4611	Dk Gray	0.045	1500	750	750	750	750	450 (232)	300 (149)
	4646	Dk Gray	0.025	1500	750	750	750	750	450 (232)	300 (149)
	4655	Dk Gray	0.062	1500	750	750	750	750	450 (232)	300 (149)
4622	4616	White	0.025	1000	250	250			250 (121)	200 (93)
	4622	White	0.045	1000	250	250			250 (121)	200 (93)
	4624	White	0.062	1000	250	250			250 (121)	200 (93)

Static Shear - ASTM D3654 - To stainless steel, tested at various temperatures and gram loadings. 0.5 in² (3.23 cm²). Will hold listed weight for 10,000 minutes (approximately 7 days). Conversion: 1500 g/0.5 in² equals 6.6 lb/in²; 500 g/0.5 in² = 2.2 lb/in².

Short Term Temperature Tolerance - No change in room temperature dynamic shear properties following 4 hours conditioning at indicated temperature with 100 g/static load. (Represents minutes, hours in a process type temperature exposure).

Long Term Temperature Tolerance - Maximum temperature where tape supports at least 250 g load per 0.5 in² in static shear for 10,000 minutes. (Represents continuous exposure for days or weeks).

Additional Typical Performance Characteristics

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

	3M™ VHB™ Tape			Units	Test Standard
	4950	4910	4611		
Dielectric Constant	2.28 1.99	3.21 2.68	2.80 2.43	at 1 kHz at 1MHz	ASTM D150 ASTM D150
Dissipation Factor	0.0227 0.0370	0.0214 0.0595	0.0130 0.0564	at 1 kHz at 1MHz	ASTM D150 ASTM D150
Dielectric Breakdown Strength	18 (460)	25 (630)	13 (330)	V/μm (V/mil)	ASTM D140
Thermal Conductivity (k value)	0.09 (0.6)	0.16 (1.1)	0.11 (0.8)	W/mK (BTU•in/hr•ft²•°F)	
Volume Resistivity	1.5 x 10 ¹⁵	3.1 x 10 ¹⁵	1.4 x 10 ¹⁵	Ω-cm	ASTM D257
Surface Resistivity	>10 ¹⁶	>10 ¹⁶	>10 ¹⁶	Ω/sq	ASTM D257
Water Vapor Transmission Rate	14.0			g/m²•day	ASTM F1249 at 38°C/1000% RH
Thermal Properties of Modeling					
Thermal Coefficient of Expansion		180 (100)		10 ⁻⁶ m/m/°C (10 ⁻⁶ in/in/°F)	
Shear Modulus (at 25°C, 1 Hz)		6 x 10 ⁵		Pa	
Poisson's Ratio		0.49			

3M™ VHB™ Tapes UL746C Listings - File MH 17478

Category QQQW2 Component - Polymeric Adhesive Systems, Electrical Equipment

3M™ VHB™ Tapes/ Product Families	Substrates	Temperature Rating	
		Minimum	Maximum
4914, 4920, 4930, 4950	Aluminum, Galvanized Steel, Enameled Steel, Stainless Steel, Ceramic, Glass/Epoxy	-35°C	110°C
	PBT	-35°C	90°C
	ABS, Polycarbonate, Rigid PVC	-35°C	75°C
4920, 4930, 4950, 4955, 4959, 4959F	Acrylic	-35°C	90°C
	Glass / Galvanized Steel*, Glass / Glass*, Galvanized Steel / Aluminum*, Aluminum / Aluminum*	-35°C	120°C
4945	Phenolic, Aluminum, Galvanized Steel, Alkyd Enamel, Enameled Steel	-35°C	110°C
	ABS, Polycarbonate, Polyamide, Stainless Steel, Acrylic/Polyurethane Paint, Polyester Paint	-35°C	90°C
	Unplasticized PVC	-35°C	75°C
4905, 4910	Polycarbonate, Aluminum, Acrylic/Polyurethane Paint	-35°C	90°C
4611, 4646, 4655	Stainless Steel, Aluminum, Galvanized Steel, Glass, Glass/Epoxy, Phenolic	-35°C	110°C
	Nylon, Polycarbonate	-35°C	90°C
	ABS, Rigid PVC	-35°C	75°C

*Substrates can be used with or without primer(s)/Coating. 3M Silane Coating, 3M Adhesion Promoter 4298UV and 3M Tape Primer 94 are used with glass substrate. 3M Primer AP111, 3M Adhesion Promoter 4298UV and 3M Tape Primer 94 are used with aluminum and galvanized steel substrates.

Outgassing

3M™ VHB™ Tapes	% TML	%VCM	%WVR
4930	0.77	0.01	0.21
4932	2.41	0.66	0.23
4945	1.24	0.01	0.19

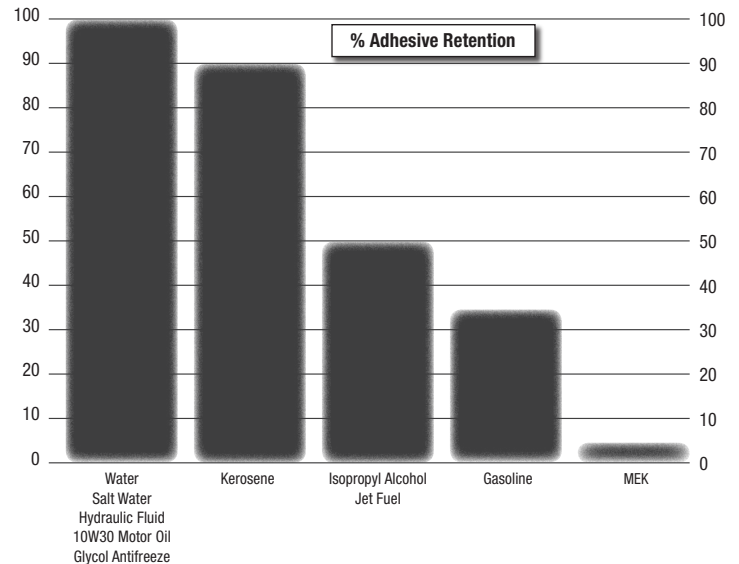
TML - Total Mass Loss

VCM - Volatile Condensable Materials

WVR - Water Vapor Regained

NASA Reference Publication, "Outgassing Data for Selecting Spacecraft Materials", (11/18/2004)
Available online at <http://outgassing.nasa.gov>

Solvent and Fuel Resistance



Test Method

- Tape between stainless steel and aluminum foil
- 72 hours dwell at room temperature
- Solvent immersion for 72 hours
- Test within 45 minutes after removing from solvent
- 90° peel angle
- 12 in/min rate of peel
- Peel adhesion compared to control

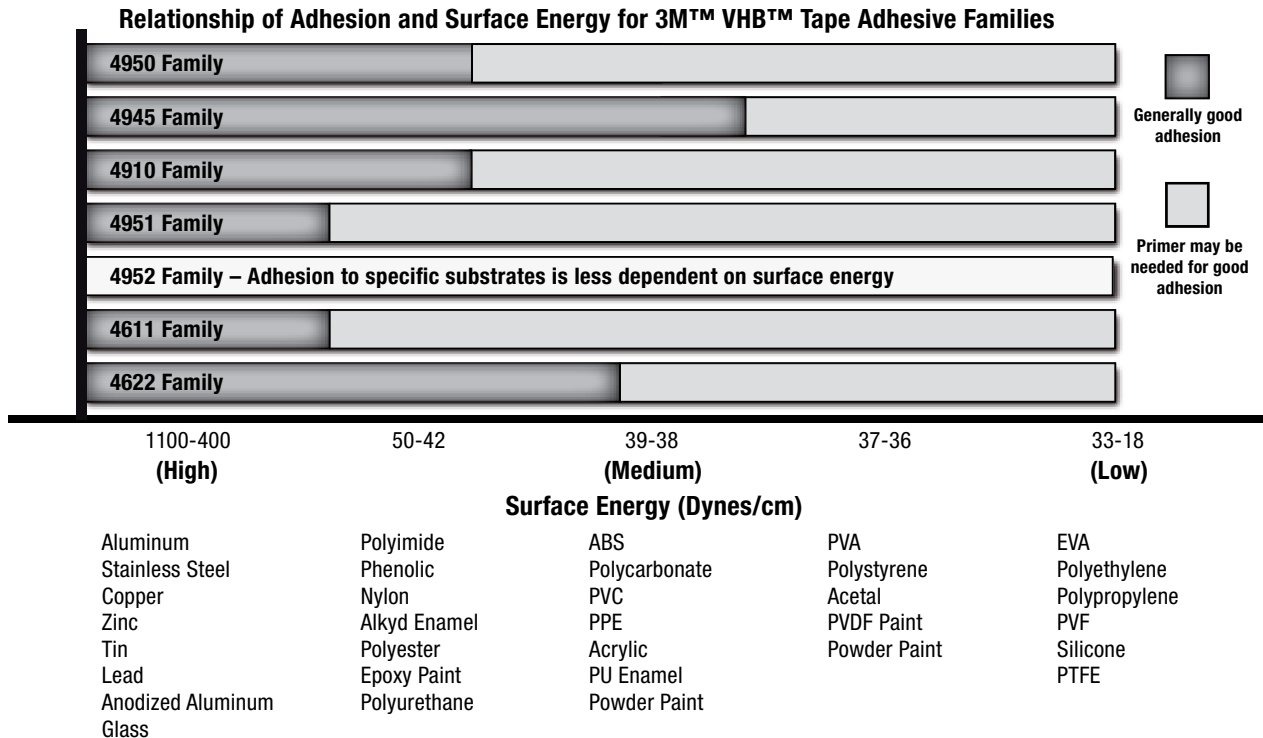
Note: Continuous submersion in chemical solutions is not recommended. The above information is presented to show that occasional chemical contact should not be detrimental to tape performance in most applications in ordinary use.

Design and Tape Selection Considerations

- **Choose the right tape for the substrate:** Adhesives must flow onto the substrate surfaces in order to achieve intimate contact area and allow the molecular force of attraction to develop. The degree of flow of the adhesive on the substrate is largely determined by the surface energy of the substrate.



This illustration demonstrates the effect of surface energy on adhesive interfacial contact. High surface energy materials draw the adhesive closer for high bond strength.



NOTES: There are a wide variety of formulations, surfaces finishes and surface treatments available on substrate materials which can affect adhesion. This chart is intended to provide only a rough estimate of the adhesion levels which can be expected on some common materials relative to a reference surface such as aluminum. Foam type can affect and/or limit maximum adhesive strength.

- **Use the right tape thickness:** The necessary thickness of tape depends on the rigidity of substrates and their flatness irregularity. While the 3M™ VHB™ Tapes will conform to a certain amount of irregularity, they will not flow to fill gaps between the materials. For bonding rigid materials with normal flatness, consider use of tapes with thickness of 45 mils (1.1 mm) or greater. As the substrate flexibility increases thinner tapes can be considered.
- **Use the right amount of tape:** Because 3M™ VHB™ Tapes are viscoelastic by nature their strength and stiffness is a function of the rate at which they are stressed. They behave stronger with relatively faster rate of stress load (dynamic stresses) and will tend to show creep behavior with stress load acting over a long period of time (static stresses). As a general rule, for **static loads**, approximately four square inches of tape should be used for each pound (57 cm² of tape per kg) of weight to be supported in order to prevent excessive creep. For **dynamic loads**, the dynamic performance characteristics provided on page 4 should be useful, factoring in the appropriate safety factors.
- **Allow for thermal expansion/contraction:** 3M™ VHB™ Tapes can perform well in applications where two bonded surfaces may expand and contract differentially. Assuming good adhesion to the substrates, the tapes can typically tolerate differential movement in the shear plane up to 3 times their thickness.
- **Bond Flexibility:** While an advantage for many applications where allowing differential movement is a benefit, the tape bonds are typically more flexible than alternative bonding methods. Suitable design modifications or periodic use of rigid fasteners or adhesives may be needed if additional stiffness is required.
- **Severe Cold Temperature:** Applications which require performance at severe cold temperatures must be thoroughly evaluated by the user if the intended use will subject the tape product to high impact stresses. A technical bulletin “3M™ VHB™ Tape Cold Temperature Performance” (70-0707-3991-0) is available for additional information.

Application Techniques

► **Clean:** Most substrates are best prepared by cleaning with a 50:50 mixture of isopropyl alcohol (IPA*) and water prior to applying 3M™ VHB™ Tapes.

Exceptions to the general procedure that may require additional surface preparation include:

- **Heavy Oils:** A degreaser or solvent-based cleaner may be required to remove heavy oil or grease from a surface and should be followed by cleaning with IPA/water.
- **Abrasion:** Abrading a surface, followed by cleaning with IPA/water, can remove heavy dirt or oxidation and can increase surface area to improve adhesion. Abrasion is not suggested with 3M™ VHB™ Tapes 4932 and 4952.
- **Adhesion Promoters:** Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints.
- **Porous surfaces:** Most porous and fibered materials such as wood, particleboard, concrete, etc. need to be sealed to provide a unified surface.
- **Unique Materials:** Special surface preparation may be needed for glass and glass-like materials, copper and copper containing metals, and plastics or rubber that contain components that migrate (e.g. plasticizers).

Refer to 3M Technical Bulletin “Surface Preparation for 3M™ VHB™ Tape Applications” for additional details and suggestions. (70-0704-8701-5)

***Note:** These cleaner solutions contain greater than 250 g/l of volatile organic compounds (VOC). Please consult your local Air Quality Regulations to be sure the cleaner is compliant. When using solvents, be sure to follow the manufacturer’s precautions and directions for use when handling such materials.

► **Pressure:** Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and helps improve bond strength. Typically, good surface contact can be attained by applying enough pressure to insure that the tape experiences approximately 15 psi (100 kPa) pressure. Either roller or platen pressure can be used. Note that rigid surfaces may require 2 or 3 times that much pressure to make the tape experience 15 psi.

► **Temperature:** Ideal application temperature range is 70°F to 100°F (21°C to 38°C). Pressure sensitive adhesives use viscous flow to achieve substrate contact area. Minimum suggested application temperatures:

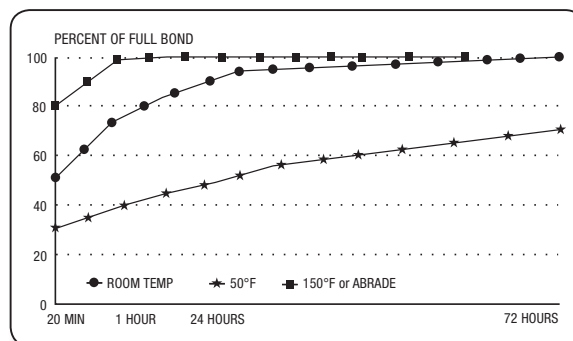
- 50°F (10°C): 3M™ VHB™ Tapes 4950, 4910, 4952, 4611, 4622 families.
- 60°F (15°C): 3M™ VHB™ Tape 4945 family.
- 32°F (0°C): 3M™ VHB™ Tape 4951 family.

Note: Initial tape application to surfaces at temperatures below these suggested minimums is not recommended because the adhesive becomes too firm to adhere readily. However, once properly applied, low temperature holding is generally satisfactory.

To obtain good performance with all 3M™ VHB™ Tapes, it is important to ensure that the surfaces are dry and free of condensed moisture.

► **Time:** After application, the bond strength will increase as the adhesive flows onto the surface (also referred to as “wet out”). At room temperature approximately 50% of ultimate bond strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. This flow is faster at higher temperatures and slower at lower temperatures. Ultimate bond strength can be achieved more quickly (and in some cases bond strength can be increased) by exposure of the bond to elevated temperatures (e.g. 150°F [66°C] for 1 hour). This can provide better adhesive wetout onto the substrates. Abrasion of the surfaces or the use of primers/ adhesion promoters can also have the effect of increasing bond strength and achieving ultimate bond strength more quickly.

Bond Typical Build vs. Time



Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

Limited Remedy

3M warrants for 24 months from the date of shipment that 3M™ VHB™ Tape will be free of defects in material and manufacture. 3M MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. This limited warranty does not cover damage resulting from the use or inability to use 3M™ VHB™ Tape due to misuse, workmanship in application, or application or storage not in accordance with 3M recommended procedures. AN APPLICATION WARRANTY EXPRESSLY APPROVED AND ISSUED BY 3M IS AN EXCEPTION. THE CUSTOMER MUST APPLY FOR A SPECIFIC APPLICATION WARRANTY AND MEET ALL WARRANTY AND PROCESS REQUIREMENTS TO OBTAIN AN APPLICATION WARRANTY. CONTACT 3M FOR MORE INFORMATION ON APPLICATION WARRANTY TERMS AND CONDITIONS.

Limitation of Remedies and Liability

If the 3M™ VHB™ Tape is proved to be defective within the warranty period stated above. THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M™ VHB™ TAPE. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including negligence, warranty, or strict liability.

ISO 9001

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001 standards.



Industrial Adhesives and Tapes Division

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3M Surface Preparation for 3M™ VHB™ Tape Applications

Technical Bulletin

August, 2017

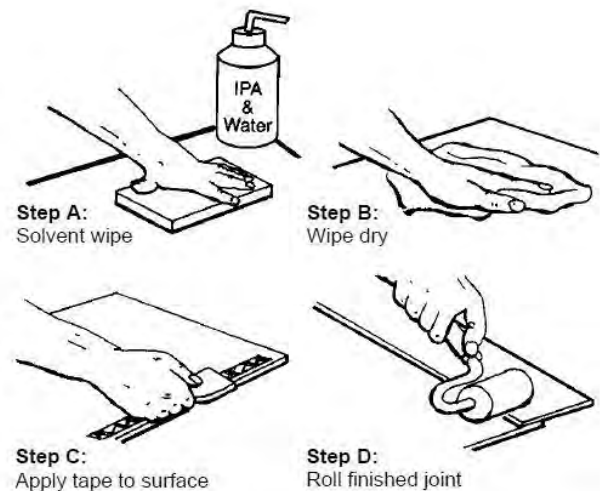
Summary Most substrates are best prepared by cleaning with a mixture of isopropyl alcohol (IPA) and water* (approximately 50% to 70% IPA) prior to applying 3M™ VHB™ Tapes.

Exceptions to this general procedure that may require additional surface preparation include:

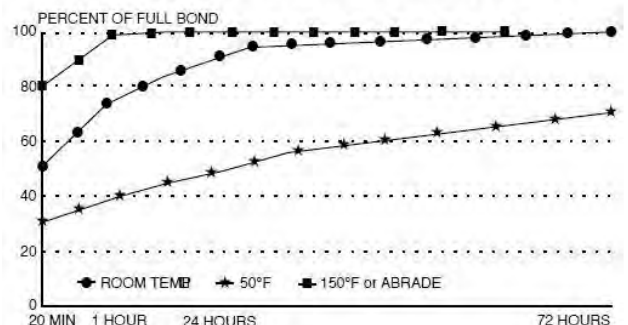
- **Heavy Oils:** A degreaser or solvent-based cleaner may be required to remove heavy oil or grease from a surface and should be followed by cleaning with IPA/water.
- **Abrasion:** Abrading a surface, followed by cleaning with IPA/water, can remove heavy dirt or oxidation and can increase surface area to improve adhesion.
- **Adhesion Promoters:** Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints.
- **Porous Surfaces:** Most porous and fibred materials such as wood, particleboard, concrete, etc. need to be sealed to provide a unified surface.
- **Unique Materials:** Special surface preparation may be needed for glass and glass-like materials, copper and copper containing metals and plastics or rubber that contain components that migrate (e.g. plasticizers).

General 3M VHB Tape Bonding Procedure

- To obtain optimum adhesion, the bonding surfaces must be stable or unified, clean and dry. A common surface cleaning solvent is IPA/water mixture.* (Steps A and B)
- As a pressure-sensitive adhesive, bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and helps improve bond strength. Generally, this means that the tape should experience >15 psi (>100 kPa) in roll down or platen pressure. (Steps C and D)
- After application, the bond strength will increase as the adhesive flows onto the surface. At room temperature, approximately 50% of the ultimate strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. Handling Strength is typically achieved immediately after application of pressure to the bonded components. In some cases, bond strength can be increased and ultimate bond strength can be achieved more quickly by exposure of the bond to elevated temperatures (e.g. 150 °F (66 °C) for 1 hour).



Typical Bond Build Over Time



* **Note:** These cleaner solutions contain greater than 250 g/l of volatile organic compounds (VOC). Please consult your local Air Quality Regulations to be sure the cleaner is compliant. When using solvents, be sure to follow the manufacturer's precautions and directions for use when handling such materials.

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Heavy Oils On surfaces with a light oily film, or other light contamination, the IPA/water solution is usually adequate. Where heavy oils or grease are present, a “degreasing” solvent such as 3M™ Prep Solvent 70, 3M™ Adhesive Remover, 3M™ Citrus Base cleaner, acetone, mineral spirits, naphtha or similar solvents can be used to cut the oil. When cleaning with solvents, always follow with an IPA/water clean to remove any residue or film that may be present.

Abrasion Abrading a surface can serve several functions:

- Remove heavy levels of dirt or oxide from metals or paints.
- Create additional surface area that can increase adhesion.
- Smooth a textured surface to obtain more flatness, allowing improved contact area and adhesion.

A finely abraded surface (approximately 180 to 320 grit scratch) can help adhesion to many paints and plastics. Very small scratches on the surface, generated with circular motion rather than straight-line motion, are most desirable. Micro-scratches on a surface increases the available surface area to bond to resulting in greater initial adhesion and achieving higher ultimate strength. 3M™ Scotch-Brite® Hand Pads (7447 Maroon or Heavy Duty Green) are optimal for achieving the right level of abrasion. Powered sanders (e.g., palm or dual-action sanders) will assist on large surface areas. Avoid grinding a surface with coarse abrasive materials, as they can create too much texture for the adhesive to adequately flow into the surface. Always clean the surface with the IPA/water solution or methods previously described, and be certain that loose particles are removed from the abraded surface prior to bonding.

Exceptions to these abrading guidelines are 3M™ VHB™ Tapes 4932 and 4952, as they typically perform best on smooth, glossy surfaces and abrasion may reduce the bond strength.

Adhesion Promoters Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints because of their low surface energy or process additives they may contain. A primer creates a new surface for 3M VHB Tape to adhere to and can also create a layer that may impede the migration of additives that may be present in a material. It is important for the user to determine the suitability of the 3M VHB Tape, the adhesion promoter and the application process.

Porous Surfaces Rough, porous or fibered materials such as wood, particleboard, cement, etc., have an open surface and require sealing to provide a unified surface for tape bonding. Common sealing materials would include paint, varnish or other hard surface coatings. Fast drying 3M™ Rubber and Vinyl Spray 80 can also be used to unify the surface and improve the tape bond.

Unique Surfaces Glass, stone, ceramic or other siliceous materials are hydrophilic (water-loving) by nature. Normally, the hydrophilic nature makes pressure sensitive adhesive bond durability susceptible to change under high humidity or exposure to moisture. In basic terms, water vapor can undercut the tape bond and interfere with the normal adhesion forces. Silane coupling agents, added to the IPA/water cleaning solution, can help reduce the “water-loving” tendency of these surfaces and enhance the tape bond in high moisture environments.

Copper, brass, and bronze are prone to oxidation even after the 3M VHB Tape is applied. To prevent a weakening of the bond, a lacquer or varnish should be applied to these surfaces. Be sure to test the tape bond to the sealer on a metal surface to verify good adhesion.

Flexible PVC (vinyl) contains plasticizers that can migrate into the tape and affect adhesion. There are several 3M VHB Tapes that are formulated to be resistant to plasticizer migration, or 3M™ Scotch-Grip™ Plastic Adhesive 2262, thinned, can serve as a barrier to migration. Rubber materials (e.g. EPDM, neoprene) can have low surface energy and may also contain plasticizers and oils. These require the use of an adhesion promoter for stable bond strength. Test for compatibility with flexible PVC and rubber materials by aging bonded samples for 7-days at 150°F (66°C) and check for softening of the adhesive, discoloration or reduction in bond strength.

*** Note:** These cleaner solutions contain greater than 250 g/l of volatile organic compounds (VOC). Please consult your local Air Quality Regulations to be sure the cleaner is compliant. When using solvents, be sure to follow the manufacturer’s precautions and directions for use when handling such materials.

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Suggested Primers The table below offers suggested primers and alternative methods for surfaces that commonly require primers, adhesion promoters or other surface treatments for successful use with 3M VHB Tapes. This list is not intended to be fully comprehensive but may be useful for many applications. It is very important for the user to determine the suitability of the 3M VHB Tape, primer and application process and compliance with local Air Quality Regulations*.

Surface	Concern	Suggested Primer	Alternatives
Steel or Aluminum	Surface must be clean	None suggested	Abrasion may clean surface, or use 3M Adhesion Promoter 111 or 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV
Copper, Brass, Bronze	Oxidation after bonding	Lacquer or varnish ^(a)	Architectural grade coatings
Concrete, Brick	Non-unified or rough surface, moisture	3M™ Rubber and Vinyl Spray 80	Concrete sealer, paint
Glass, Stone, Ceramic Tile	High humidity, moisture	3M™ Silane Glass Treatment AP 115 or similar silane coupling agent in IPA/water mixture ^(a)	3M Tape Primer 94
Wood (soft, hard particle board, etc.)	Weak fiber layer on surface (e.g., low surface strength)	3M Rubber and Vinyl Spray 80, 3M™ Fastbond™ 30 Contact Adhesive	Urethane paint, varnish
Plastics: Polyolefin Non-olefin	Low adhesion Additives, low adhesion	3M™ Tape Primer 94 or 3M™ VHB™ Tape Universal Primer UV (additional surface preparation may be required) 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV	Flame treatment, Corona treatment Abrade or 3M™ VHB™ Tape Family 5952
Polyurethane (Molded or Rubber)	Mold release, low adhesion	3M Tape Primer 94, 3M VHB Tape Universal Primer UV (additional surface preparation may be required), or 3M™ Adhesion Promoter 111	Abrade followed by priming
Rubber: Neoprene, Santoprene EPDM	Migrating oils Low adhesion	3M Tape Primer 94 or 3M VHB Tape Universal Primer UV (additional surface preparation may be required) 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV	3M™ Heat-Activated Tapes 3M Heat-Activated Tapes
Paints	Low adhesion	3M Adhesion Promoter 111	Abrade or 3M VHB Tape Family 5952 or 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV
Coil Coated Aluminum	Low adhesion	3M Adhesion Promoter 111	Abrade or 3M VHB Tape Family 5952 or 3M Tape Primer 94 or 3M VHB Tape Universal Primer UV
Flexible PVC (Vinyl)	Plasticizer migration	3M™ Scotch-Grip™ Plastic Adhesive 2262 ^(b) , 3M Rubber and Vinyl Spray 80	3M™ VHB™ Tapes 4945 and 4941 (test for migration)

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(a) Refer to supplier of lacquer, varnish, or silane coupling agent for information on VOC content.

(b) 3M Scotch-Grip Plastic Adhesive 2262 contains 183 g/l VOC.

Primer Source and Description

- **3M Tape Primer 94, 3M Adhesion Promoter 111, 3M VHB Tape Universal Primer UV, and 3M Silane Glass Treatment AP 115** are available through distributors who carry 3M VHB Tapes.
- **3M Scotch-Grip Plastic Adhesive 2262** must be thinned in acetone or MEK* in a 1:5 or 1:10 ratio (e.g., 1 part Scotch-Grip plastic adhesive 2262 to 5 parts acetone or MEK). The product is also available premixed as 3M Scotch-Grip Plastic Adhesive 2262AT (3.5 g/l VOC).*
- **Silane Coupling Agent** is also available premixed in a 91:9 IPA/water solution or as a concentrate. A 0.5 wt. % level of silane^(c) adhesion promoter diluted in a 91:9 IPA/water cleaning solution has been found to be sufficient. Suggested sources for silane coupling agents:

Custom-Pak Products, Inc.
Lancaster Synthesis, Inc.

www.custompakproducts.com
www.lancastersynthesis.com

available premixed in IPA/water
available 100% concentrated

(c) **Note:** Be sure to read and follow silane and solvent manufacturer's precautions and directions for use for proper handling and storage information.

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Verification

Because 3M cannot anticipate all of the different possible surfaces and contaminants that may exist, it is imperative that the user conduct an evaluation to determine the suitability of 3M™ VHB™ Tapes, surface preparations procedures, and any other processes that may have an influence on the performance of the tape or the bonded parts. Likewise, where there are any changes in plastic or paint formulation, or suppliers of these materials, it is advisable to run evaluations to ensure that the change has not influenced the compatibility of the surface with 3M VHB Tapes.

Pressure Applicators (Hand-held J-Rollers)

Beno J. Gundlach Company
Gundlach V300 Pressure Roller
www.benojgundlach.com

Marshalltown Company
2" Flat Solid Rubber Seam Roller Item
19560, PN E54D
www.marshalltown.com

Rockler Woodworking and Hardware
High Pressure J Roller #50014
www.rockler.com

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

Limited Warranty

3M warrants for 24 months from the date of manufacture that 3M™ VHB™ Tape will be free of defects in material and manufacture. 3M MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. This limited warranty does not cover damage resulting from the use or inability to use 3M™ VHB™ Tape due to misuse, workmanship in application, or application or storage not in accordance with 3M recommended procedures. AN APPLICATION WARRANTY EXPRESSLY APPROVED AND ISSUED BY 3M IS AN EXCEPTION. THE CUSTOMER MUST APPLY FOR A SPECIFIC APPLICATION WARRANTY AND MEET ALL WARRANTY AND PROCESS REQUIREMENTS TO OBTAIN AN APPLICATION WARRANTY. CONTACT 3M FOR MORE INFORMATION ON APPLICATION WARRANTY TERMS AND CONDITIONS.

Limitation of Remedies and Liability

If the 3M™ VHB™ Tape is proved to be defective within the warranty period stated above. THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M™ VHB™ TAPE. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including negligence, warranty, or strict liability.



This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001 standards.



Industrial Adhesives and Tapes Division

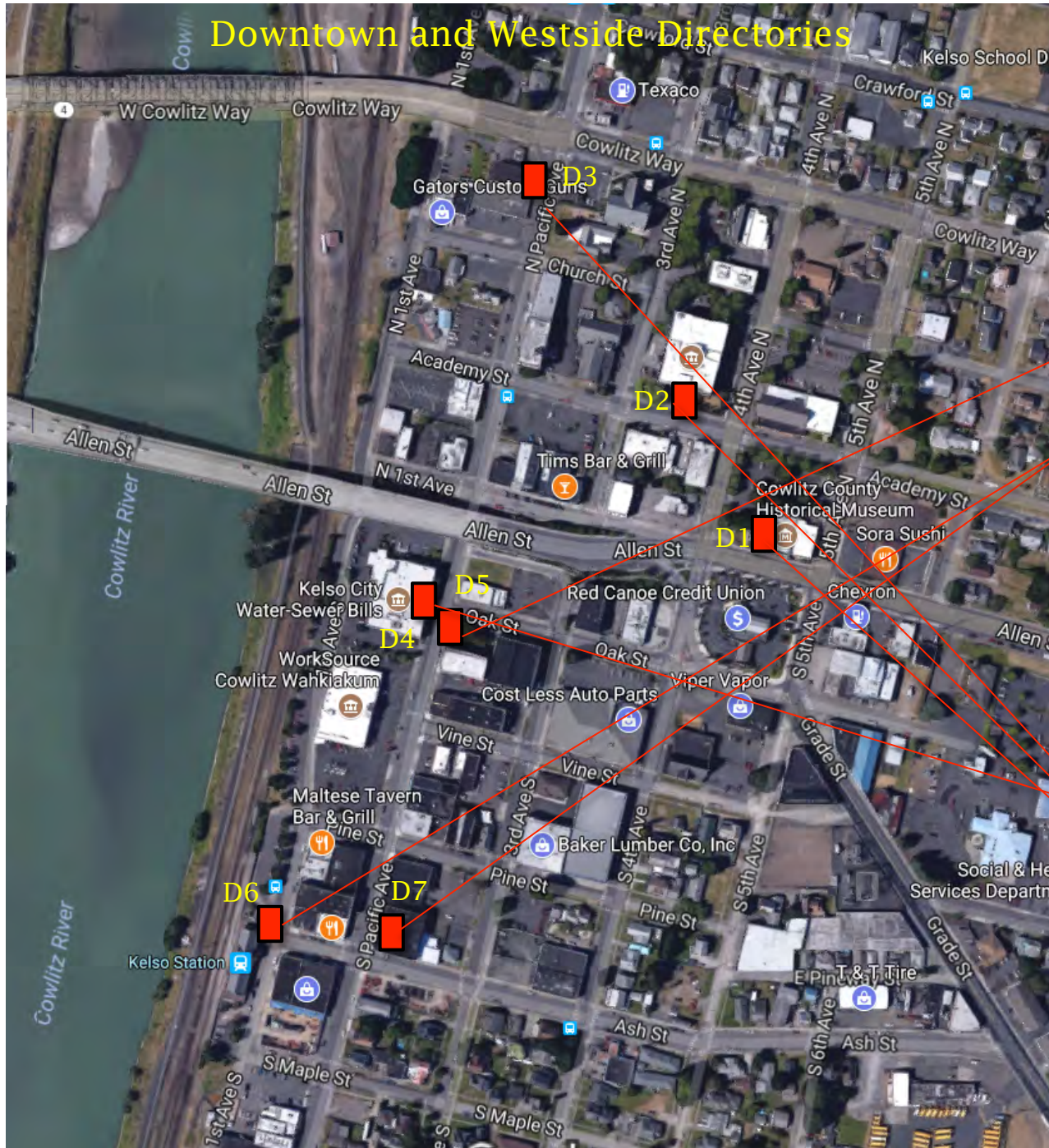
3M Center, Building 225-3S-06
St. Paul, MN 55144-1000
800-362-3550
www.3M.com/VHB

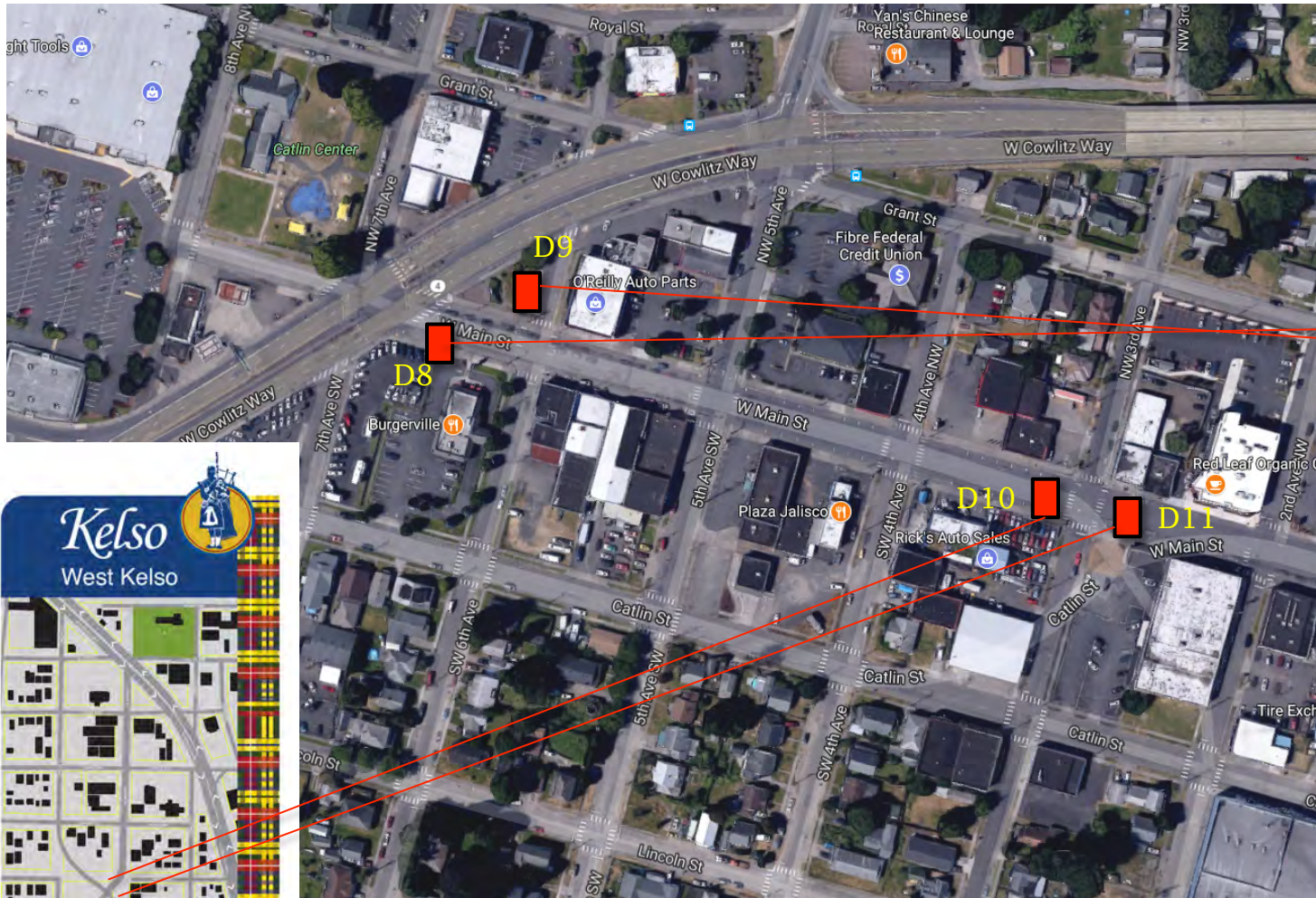
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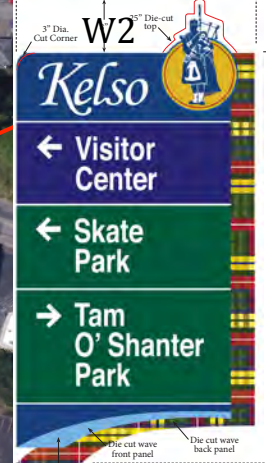
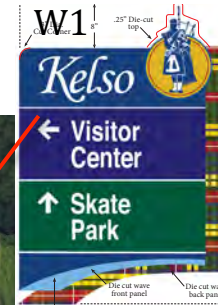
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Directory and Gateway Sign Placement Locations
For Reference

Downtown and Westside Directories









T1



G3



W5



G4



W6



W7





W8



W9



W10



W11



T2-3



