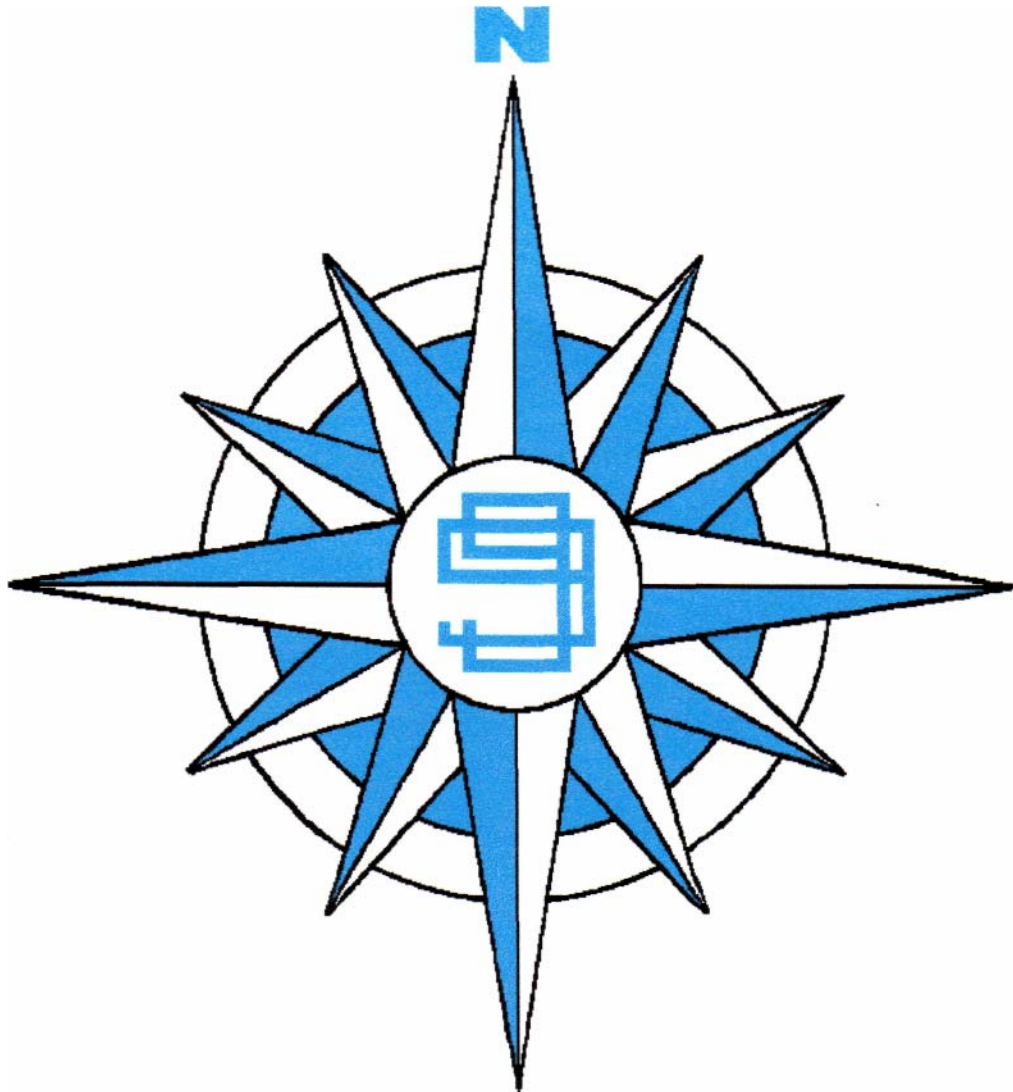


AIRMARKING GUIDE



THE NINETY-NINES, INC.

INTERNATIONAL ORGANIZATION OF WOMEN PILOTS



THE NINETY-NINES, INC.
International Organization of Women Pilots
International Airmarking Chairman

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June 14, 2021

When I became Delaware Chapter Airmarking Chairman in 1991, the only manual we had was a very much recopied one that had been prepared by the Southwest Section Airmarking Chairman in the early part of 1977, with some revisions added by the International Airmarking Chairman in August 1977. Also included was a lettering layout guide prepared by the Palomar Chapter.

In the intervening years, updates have been added to include tips and tricks from members. I created the Mt. Shasta compass rose layout diagrams from a photo of their compass rose in 2000. On the advice of general counsel, Cecile Hatfield, we added the indemnification clause that is in the letter shown on page 4. Please contact me if the airport has any issues about the indemnification paragraph.

Ninety-Nines documents and content posted on the 99s website are property of The Ninety-Nines, Inc. and are intended for use for 99s activities only. Any use of these documents or content for other than 99s-related activities requires written permission from The 99s President. Members may use the manual while working with other groups such as the EAA, Scout troop, or airport support organization. Do not copy and give to a non 99s group.

On June 9, 2004, the FAA Part 139 regulations were issued that cover airports serving scheduled air carrier operations in aircraft designed for more than 9 passenger seats but less than 31 passenger seats. This means that a greater number of airports must comply with the FAA Airport design and painting requirements of AC 150/5300-13A and AC 150/5340-1 (latest edition of both). For other airports, these ACs are recommendations.

The FAA issued a new Airport Design AC 150/5300-13A September 29, 2012. Appendix 6, covering Compass Calibration Pads has several changes from the previous AC. Note the new requirement for radial marking as shown on Pgs. 44 and 69. AC 150/5300-13A Appendix 6 is included in this manual. Please contact me if you have any questions about this.

Links have been put into the indexes on page 2 and 25 to help move around the manual.

Anyone using the guide is requested to provide suggestions for additions, deletions, and changes to me at the address listed in the current online membership directory. All help will be greatly appreciated.

Happy Airmarking!

Ellen Nobles-Harris
International Airmarking Chairman

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SECTION 1

Starting an Airmarking Project

Definition: Airmarking (one word)

1. Markings on airport surfaces intended to be seen from air. Markings are field identifier, name, elevation and/or frequency.
2. Markings on non-airport surfaces showing distance and direction to airport. Most commonly used in the 1930s to 1960s.
3. Compass rose painted on airport surface (ramp area) used for swinging a compass.
4. Runway and taxiway surface markings (lines) showing runway numbers, centerline, side lines, hold short lines, etc. We have not gotten requests for this in the last 30 years.
5. The act of painting the markings listed above.

Airmarking projects can start a number of different ways. A chapter approaches a local airport to determine if they would like an airmarking. An airport representative contacts the 99s. Requests come into your Section Airmarking Chairman, Governor, the International Airmarking Chairman, or Headquarters. The International and Section Airmarking Chairmen and Governors do our best to link the requester to a local chapter.

A chapter member can also contact your State Department of Transportation or Aeronautics and the local county, city or airport authority. They may be aware of airports that need airmarking. The state or local authority may even furnish the paint, if the airport cannot.

If you have no success learning of airports needing marking by one of the above methods, write letters to airports in your area to see if they are interested. Ask chapter members to mark their Sectional Charts, if they notice airports that might need marking.

Airmarkings are not limited to airports. Several chapters have painted an "airport" on an elementary school playground. The Rappahannock Aviation Outreach painted a miniature compass rose at The Outdoor Center for Aviation Education at Stafford Regional Airport). These are all used during Air Bear and other aviation education activities.

Once the word gets around that your chapter airmarks, you will probably have airport managers calling you.

After identifying the airport that needs marking, contact the airport manager to see if there is agreement. Appendix 1 is a "Frequently Asked Questions Sheet" that I have been using to answer questions about Airmarking that come in from airport owner/operators/tenants. Make sure that you find out if the airport is certified under Part 139 (See Section 2). Assuming there is agreement for an airmarking, a date needs to be set. The airport manager will generally agree to supply the paint. The chapter supplies workers, expertise, rollers, and brushes, etc.

When first approaching the airport manager, present him/her with a proposed layout of the airmark on graph paper, illustration, or photo. Look at the 99s Airmarking Website (<http://www.ninety-nines.org/airmark.html>) for photographs that can be used. The website has links to photos of airmarkings that have been done over the last several years. This includes compass roses and airport identifiers. This will give a professional appearance to your presentation.

Once agreement is reached that a specific airport will be painted, the airport manager should send a letter similar to the one at the end of this section to the Chapter Airmarking Chairman, prior to performing the work. The Airmarking Chairman can also reword this letter and send it confirming their agreements relative to the airmarking. This is for legal reasons, and it also transmits a professional attitude by the chapter performing the work. Please send a copy of this letter to 99s Headquarters for your chapter file.

If a compass rose is going to be painted, The Ninety-Nines, Inc. requires that a properly licensed surveyor/engineer establish the MAGNETIC north-south line for the rose. AC 150/5300-13A, Appendix 6 has a suggested method for the survey. This is normally handled by the airport or FBO. This can also be done by a municipal engineer, depending on who is operating the airport. The engineer/surveyor should also mark all the 30 degree points. Make sure that all the points are MAGNETIC. Also, find out the local annual change in variation for where the rose will be

SECTION 1

Starting an Airmarking Project

located. Have the airport send a confirmation to you as to when the survey was done and by whom and gives you the annual change in variation. Please also send a copy of this letter to Headquarters for your chapter file. Since magnetic north changes every year, the survey date and change in variation needs to be painted beside the compass rose. This can be found at <http://www.ngdc.noaa.gov/geomag-web/#declination>. Note: Declination = Variation.

Although we have Ninety-Nines who are qualified to survey compass roses, The Ninety-Nines, Inc. requests the airport/FBO to use the services of a non-Ninety-Nine licensed surveyor to limit any risk of exposure to liability for The Ninety-Nines, Inc.

Many chapters have seen the need for identification signs for gas, hangars, phones, etc. They have used exterior plywood with safety red exterior enamel painted on for a background. The letters are painted on in white exterior enamel with glass beads pressed into them. The glass beads usually have been furnished by the highway department.

Sample Letter From Airport Manager

April 30, 2000

Ms. Jane Marple, Airmarking Chairman
Low Hill Chapter, The Ninety-Nines Inc.
3276 Second Avenue
Low Hill, California 94666

Dear Ms. Marple:

This is to certify that I have given permission to Jane Marple, Airmarking Chairman of the Low Hill Chapter, The Ninety-Nines, Inc., and other persons authorized by her to airmark on the premises of the Low Hill Airport, located in the city limits of Low Hill and/or the county of Hill.

This airmark is to read "Low Hill El. 123" and is to be located on the parallel taxiway to Runway 13/31.

It is understood that I will furnish the paint or the money necessary to purchase the paint and thinner and that it will be the responsibility of the Low Hill Chapter Ninety-Nines to furnish all other supplies as well as labor.

This airmarking is to be painted on the 11th of May 2000. If unfavorable weather or other difficulty should arise on this date, an alternate date would be the 18th of May 2000.

If this airmarking is a compass rose, a copy of the surveyor's report will be given to the chapter.

The Low Hill Airport agrees to indemnify, defend or hold harmless The Ninety-Nines from any damages or injuries of whatever nature or kind to persons or property arising directly or indirectly from The Ninety-Nines airmarking on the airport.

Respectfully,

I. M. Ready
Low Hill Airport Manager

SECTION 2

FAA Certificated Airport Requirements - Part 139

On June 9, 2004, the FAA Part 139 regulations started covering airports serving scheduled air carrier operations in aircraft designed for more than 9 passenger seats but less than 31 passenger seats. This means that a greater number of airports must comply with the FAA Airport design and parting requirements of AC 150/5300 and AC 150/5340-1 (latest edition of both).

Elizabeth Matarese, FAA Airports Certification and Safety, supplied some of the information that follows in 1996 relative to Part 139 Certification.

When contacting the airport manager or owner, determine the status of the airport. It will be either a Certificated or non-Certificated airport. A Certificated airport is governed by Part 139. A non-Certificated airport may be governed by Grant Assurances, if it has accepted Federal Funds. The FAA has a website (http://www.faa.gov/airports/airport_safety/part139_cert/) that contains an *Airport Certification Status Table*. You can use this table to check if an airport falls under these regulations.

If the airport is a Part 139 Certificated airport, ensure that the airport manager agrees to the location of the compass rose or other airmarking. It may be advisable for the airport manager to contact the FAA Regional Certification Safety Inspector to identify an appropriate location for the airmarking, if the airport manager is unsure of locating it appropriately.

If the airport is not certificated, the compass rose or other airmarking is less critical in terms of compliance, the same general principles apply. Human factors studies have shown that consistency enhances safety. If pilots can expect to see the same features at all airports, the comfort level is increased. They will not meet unexpected marking on pavement; they will expect to find appropriate marking and airmarking in locations that do not impede traffic. In addition, they can count on correct and accurately airmarked checkpoints that offer reliable information.

Today's regional and major airline pilots are coming from General Aviation. One of the best ways to prepare them for the air carrier environment is to promote those safety items on our GA airports which they will find at the airports serving air carriers and which they will be expected to know and comply with. This will make them better prepared and will enhance the "professionalism" and comfort level of *all* pilots who may be going into one of the "larger" airports. Marking, lighting and signing have been prominent lately as subjects addressed by NTSB and FAA. Various studies indicate that an airport that fosters professionalism in its own management generally produces a quality pilot population.

A professional engineer or licensed surveyor, possibly one who contracts to work with the airport or a state-employed engineer *must* be contacted well in advance of the compass rose airmarking, to set the magnetic North-South line and the 30° radials. Please make sure that they use **magnetic** north for the compass rose layout. Also ask the surveyor to give you the annual change in variation. This can also be found at <http://www.ngdc.noaa.gov/geomag-web/#declination>. Use the WMM (2019-2024) model.

Airmarking should not take place on runways or any area designated as a *movement area*. Runway marking is extremely important, especially if a Standard Instrument Approach Procedure (SIAP) has been established, as precision and non-precision approach marking is specific. Even if there is not SIAP for a runway, *any* other location is better than a runway. *Movement areas*, however, are also not suitable, because these areas are used for expediting traffic. Thus, taxiways or other locations that have been removed from *movement areas* status on Part 139 Certificated airports and taxiways on non-Certificated or General Aviation airports, as well as ramps, aprons, hangar roofs, and water towers are appropriate places for Unicom frequencies or alphanumeric identifiers. Note: "removed from *movement areas* status" can be as easy as the airport modifying their map and possibly painting a hold short line to indicate the need to stop and request permission from the tower before traveling onto a *movement area*.

SECTION 2

FAA Certificated Airport Requirements - Part 139

Other FAA Requirements

Over the years, I have been asked about other requirements for airmarkings. The following references are offered for your information. They can be obtained in .PDF form from the FAA website. To get to these documents go to www.faa.gov. Under the **Regulations and Guidelines** section, click on the **Advisory Circulars (ACs)** link. The easiest way to find the referenced AC is to put its number in the search box and click on **Go**. Make sure you look for the highest revision letter or change number. You may also find a copy that consolidates a number of changes. This is the case for AC 150/5300-13A. If you have questions, please contact the International Airmarking Chairman.

The FAA AC for Airport Design, AC 150/5300-13A, is the guidance document used for airport construction and has to be followed for airport certification. This AC, dated 9/28/2012, is over 300 pages long and is better viewed and is searchable in the .PDF format from the FAA website. This AC includes instructions for a **Compass Calibration Pad** in Appendix 6 which is attached in Appendix 6. It is preceded by a discussion of the differences between the 9/28/2012 Appendix 6 and the old Appendix 4 from AC 150/5300-13.

AC 150-5300-13A contains information on runway and taxiway safety zones and object free areas.

Runway Safety Area (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from a runway.

Taxiway/Taxilane Safety Area (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft deviating from the taxiway.

Object Free Area (OFA): An area centered on the ground on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by remaining clear of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Compass roses need to be located outside these safety zones.

The size of the safety zone or object free area depends on the size of airplane that the airport is designed to handle. Please consult this Advisory Circular for more detail. I have included two tables and one figure from this AC below. More detail and illustrations are available in the AC on the web.

Group #	Tail Height (ft)	Wingspan (ft)
I	<20	<49
II	20 - <30	49 - <79
III	30 - <45	79 - <118
IV	45 - <60	118 - <171
V	60 - <66	171 - <214
VI	66 - <80	214 - <262

Source: AC 150/5300-13A, Chapter 1, pg. 13

SECTION 2

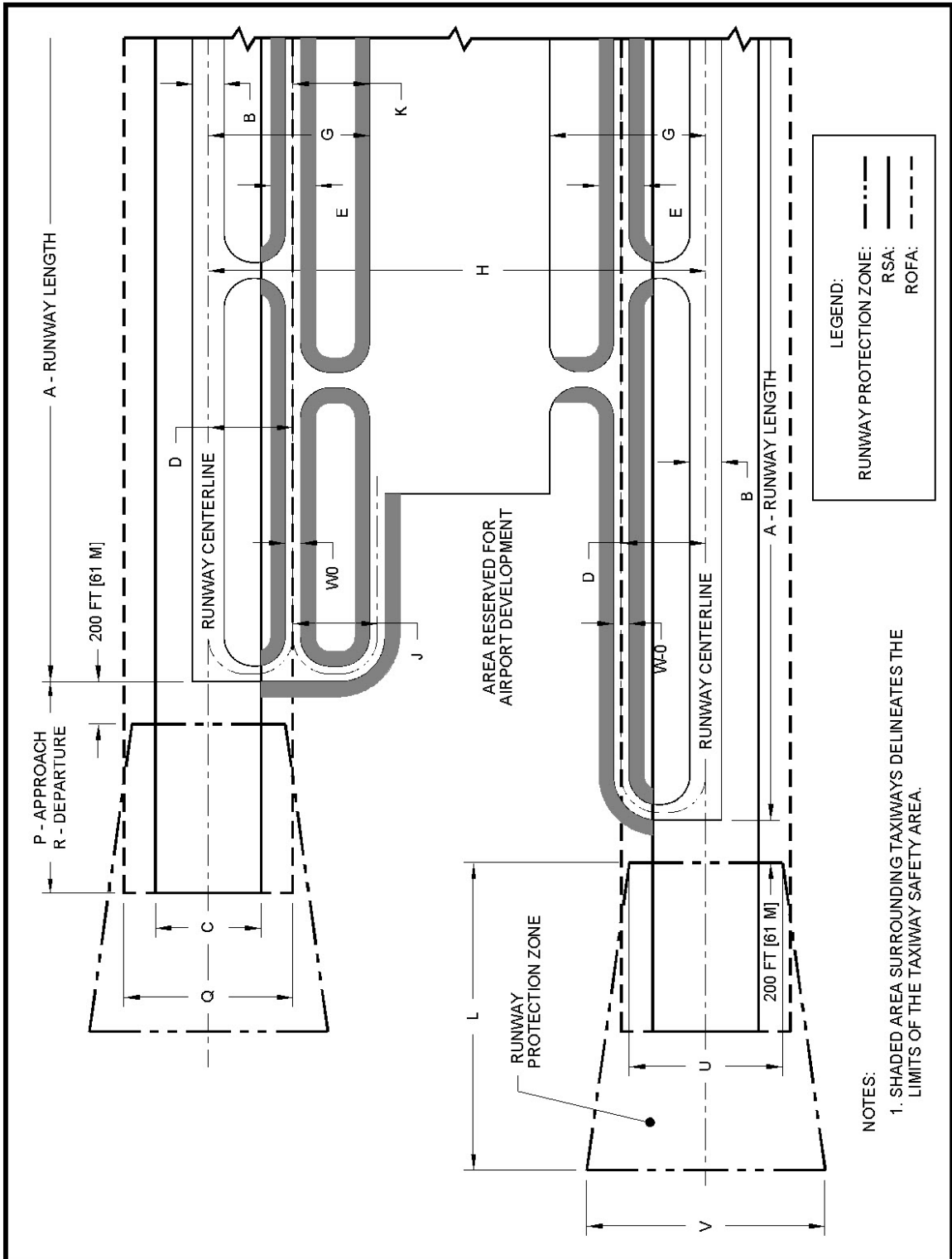
FAA Certificated Airport Requirements - Part 139

Table 2-3. Taxiway and taxilane separation standards							
ITEM	DIM See Fig 3-26	AIRPLANE DESIGN GROUP					
		I	II	III	IV	V	VI
TAXIWAY PROTECTION							
Taxiway Safety Area (TSA)	E	49 ft (15 m)	79 ft (24 m)	118 ft (36 m)	171 ft (52 m)	214 ft (65 m)	262 ft (80 m)
Taxiway Obstacle Free Area	K	89 ft (27 m)	131 ft (40 m)	186 ft (57 m)	259 ft (79 m)	320 ft (98 m)	386 ft (118 m)
Taxilane Obstacle Free Area	J	79 ft (24 m)	115 ft (35 m)	162 ft (49 m)	225 ft (69 m)	276 ft (84 m)	334 ft (102 m)
TAXIWAY SEPARATION							
Taxiway <i>Centerline to Parallel Taxiway/ Taxilane Centerline</i> ¹	J	70 ft (21 m)	105 ft (32 m)	152 ft (46.5 m)	215 ft (65.5 m)	267 ft (81 m)	324 ft (99 m)
Taxiway <i>Centerline to Fixed or Movable Object</i>	K	44.5 ft (13.5 m)	65.5 ft (20 m)	93 ft (28.5 m)	129.5 ft (39.5 m)	160 ft (48.5 m)	193 ft (59 m)
Taxilane <i>Centerline to Parallel Taxilane Centerline</i> ¹		64 ft (19.5 m)	97 ft (29.5 m)	140 ft (42.5 m)	198 ft (60 m)	245 ft (74.5 m)	298 ft (91 m)
Taxiway <i>Centerline to Fixed or Movable Object</i>		39.5 ft (12 m)	57.5 ft (17.5 m)	81 ft (24.5 m)	112.5 ft (34 m)	138 ft (42 m)	167 ft (51 m)
WINGTIP CLEARANCE							
Taxiway Wingtip Clearance		20 ft (6 m)	26 ft (8 m)	34 ft (10.5 m)	44 ft (13.5 m)	53 ft (16 m)	62 ft (19 m)
Taxilane Wingtip Clearance		15 ft (4.5 m)	18 ft (5.5 m)	23 ft (6.5 m)	27 ft (8 m)	31 ft (9.5 m)	36 ft (11 m)
Note: 1. These values are based on wingtip clearances. If 180 degree turns between parallel taxiways are needed, use this dimension or the dimension specified in Table 4-2, whichever is larger.							
Source: AC 150/5300-13A, Chapter 4, pg. 124.							

Editor's Note: Object can be an airplane being swung on a compass rose or parked. It is not just a fixed building. It is anything higher than 6" in the Object Free area.

SECTION 2

FAA Certificated Airport Requirements - Part 139



Note: Dimension letters are keyed to [Table 3-8](#), [Table 4-1](#) and [Table 4-2](#).

Figure 3-26. Typical airport layout

Source: AC 150/5300-13A, Chapter 3, pg. 96

SECTION 3

Supplies Required

Paint:

Highway traffic paint is the preferred type to use. The paint and, sometimes, brushes and other materials can be obtained either from the airport management or from the State Highway Department. To be consistent with 99s branding white and blue should be used. "Handicap" Blue is the blue normally used for part of the 99s compass rose. The blue is normally 2 oz. blue pigment per gallon white. The paint supplier should know how to color the paint.

If the county, city or airport will provide the paint; you may have to make arrangements to have it delivered to the airport or building to be airmarked.

If the paint must be purchased, such as for a private airport, the airport will generally buy it. Also, you might be able to get FBOs on the field to chip in for the paint and/or supplies. Highway marking paint has an expiration date and airports and municipalities throw the paint out. This paint is perfectly good for an airmarking project. You might suggest that the airport check to see if they have paint close to the expiration date and maybe their municipality's road departments might have some close to expiration.

Thinner may be required to mix with the paint and for cleanup. If so, whoever supplies the paint should also provide whatever type is required. The paint supplier should know how to properly thin it.

Some chapters have had great success with acrylic latex. This is water-based paint and water is used for thinning and clean-up. Other chapters use oil based paints.

Always paint the white first, and then use the same equipment for the blue or yellow. If painting on asphalt, some black paint can be used as an "eraser" for spills.

I have heard that that some chapters heard a recommendation about using an anti-graffiti sealer on top of a compass rose to help it last. A technical expert from Sherwin-Williams told me that anti-graffiti sealers are designed for vertical surfaces only. If used on a horizontal surface, it is subject to "hot tire pick-up". That means that when hot tires go over a compass rose or airport identifier, the tires will actually pick up the paint.

The Sherwin-Williams expert also told me that new ramp surfaces need to be fully cured before painting. She recommended 90 days for asphalt and 30 days for concrete. If there is bleed through, it is because the surface is not fully cured.

If the airport is going to seal the surface before the planned airmarking, they need to make sure the sealer is compatible with the paint. They should get a recommendation from the paint manufacturer. If they do not, a sealer should not be used. At minimum, you need to let the sealer cure, the same as asphalt, if you or the airport feel that the sealer must be used.

If painting a concrete surface, figure about 1 and 1/4 gallons of paint per one 20-foot letter. If painting asphalt, figure at least 3 gallons for each 20 foot letter. For the 80' Mt. Shasta Chapter compass rose on a primed, asphalt surface, 15 gallons of blue and 20 gallons of white were used. One chapter used 15 gallons paint and 5 gallons thinner for 1,080 square feet of marking. They mixed the paint 1 gallon thinner to 5 gallons paint.

The International Airmarking Chairman has created an Excel spreadsheet to use for calculating the area painted on a compass rose. It is available on request. As a rough guide for total area to be painted, see the table below. Use this as a guide to determine how much paint you will need. The paint supplier should be able to tell you how much area a gallon of paint will cover.

Approximate Total Area to be Painted – Mt. Shasta Compass Rose				
Inner Circle Radius – ft.	Outer Circle Radius – ft.	Radius N/E/S/W Points – ft.	Radius 30° Points – ft.	Total Painted Area – sq. ft.
10	20	35	25	1,768
10	25	40	30	2,379
15	30	45	35	3,473
15	40	50	40	5,211

SECTION 3

Supplies Required

Paint Rollers:

Have at least one for each painter. A longer nap roller is preferred for marking asphalt. Check the paint manufacturer's application specifications. (See Appendix 4) Usually the roller covers cannot be reused for other airmarkings. The better roller covers are more durable and will last throughout the day. Less expensive ones tend to have to be replaced more frequently. Watch for sales in local newspapers. Some chapters have found the cheaper ones to be adequate. A small roller can be useful for corners and edges. See note at end of this section about where to buy.

Roller Handles:

Have one for each painter. The end of the roller handle should be threaded inside so that long poles can be attached.

Long Poles:

Have one for each painter. These are screwed into the roller handles and allow accurate painting without kneeling or bending. Long handles will save much back breaking work and kneeling. Your painters will thank you. See Miscellaneous Suggestions, Section 7 for a way to use these to "reward" the painters.

Paint (Roller) Trays:

Have one tray for every two painters. If you are using trays, you may want to line them with heavy duty aluminum foil. This will make tray clean-up easier. Avoid the plastic paint tray liners if you are using an oil-based paint unless the packaging indicates that the trays will work with oil based paint. Note: the solvent for the Sherwin-Williams acrylic paint in Appendix 4 is acetone. Acetone will also dissolve plastic tray liners.

Paint Containers:

One gallon or ½ gallon milk or bleach containers can be used as paint pots. Cut out a hole leaving the handle of the jug as a handle. Fill only two (2) inches with paint as it gets hard to hold if too full. The advantage of this is they can be trashed and do not have to be cleaned when you finish painting. If you are using oil based paint, test the container to make sure the paint does not melt the plastic. Coffee cans work well too. Carry cans with a drip pan underneath to prevent dripping on the asphalt/concrete surface.

100' Tape Measure:

It is much easier to measure long distances accurately with a tape measure longer than the distance to be measured. A lot of extra effort will be needed if short ones are used.

Chalk Lines:

Two or more chalk lines should be available at all times. It works best to have three people on a chalk line, one at each end and one in the middle to "snap it." Chalk lines can be purchased at a hardware or home improvement store. They also may be available at paint stores.

Chalk:

Powdered chalk, at least one container will be required per airmarking. Use yellow, white or blue chalk for asphalt. Use yellow or blue for concrete. Red chalk does not show up well on asphalt. Use new chalk. Old chalk, stored in the chalk line, will probably be caked and will not work well. Chalk sticks or Dixon crayons can be used to mark all corners so no mistakes will be made as to which line is the right one to paint. Carpenter's chalk or Dixon crayons, available at a hardware or home improvement store, is more durable than blackboard chalk for marking lines.

SECTION 3

Supplies Required

Stirrers:

At least one heavy duty stirrer per color is required if paint comes in 5-gallon containers. A three-foot piece of 1"x3" board or scrap wood works very well. For one gallon cans, two feet of scrap wood or the "give-away" stirrers from the paint store work well. If you have the opportunity, see if a paint store will put the cans on their paint shaker. It will make using the stirrers easier.

Rags:

These are always necessary for cleanup of the rollers and the workers. Cotton ones are the best. They also come in handy when paint is spilled in the wrong location (see Painting, Section 6).

Brooms:

Push brooms are always necessary to clean the area to be marked prior to laying out the letters or painting. One broom is essential and more are better. Sometimes the airport will be able to furnish these, but always check. At several airmarkings, a helicopter flew over and "brushed" off the spot by hovering over the site for the compass rose. Leaf blowers can also be used. Normally, electricity will not be available so a gasoline operated blower will be necessary.

Brushes:

Several small brushes are helpful for filling in corners and points. Again, follow the paint manufacturer's recommendation for type of brush. Martha MacLeod, Michigan Chapter, says that a dry four inch wide, thick paintbrush is a great eraser for chalk lines.

Screwdriver:

A sturdy screwdriver is very handy to pry open paint cans.

Hoe or Spade:

One or the other does a good job of clearing the weeds or grass away from the area to be marked or painted.

Templates:

Templates are used to lay out corners of letters and numbers as shown in Appendix 2. Some areas are fortunate enough to have the county supply templates to lay out the required letters and numbers. Foam core boards make good templates. To make bigger sheets, join together by butting edges and using wide packaging tape along the seam on both sides of the sheet. The foam core board can be cut with a mat knife. Four foot by eight foot sheets of foam core board are available at the local home supply stores. Have something to weigh the templates down so the wind does not pick them up.

Polyethylene:

A large sheet of polyethylene, a painter's drop cloth, or a large flat garbage bag makes an excellent area for stirring, thinning, pouring paint, etc. If you spill some, it won't mess up the area and clean-up is easy. Have something to weigh down the sheet or cloth so that it does not blow away.

Compass for Drawing Circles:

Have a heavy cardboard tube, broom handle, or other round piece of wood with flat end or piece of pipe for the compass center. Get a non-stretching piece of twine or thin rope longer than the radius of the largest circle to be drawn. Use polyester rope. Nylon, polyethylene, or PVC rope will stretch. Tie a loop in the end of the twine and place around the tube. The tube is centered in the circle to be drawn. Pull twine tight, tie chalk or crayon at the proper distance from the center and

SECTION 3

Supplies Required

draw circle. This works just like the small metal compass we used in geometry (way back when for some of us) for drawing various small circles.

Masking Tape:

Masking tape can be used to outline letters for sharp paint lines. Keep in mind, small irregularities may show up when standing 4-5 feet above the letter, however, they cannot be seen from 1000 feet. Two-inch masking tape works well. You can "walk it down." Pressing it in with your feet should result in very little leakage under the tape when painting. Masking tape can be used. You do not need to get the blue painter's tape. One member wrote me: The blue painters tape worked really well. I was lucky to pick up the blue tape at BIG LOTS ONE DAY - two rolls for \$1.99. Otherwise the tape is pretty expensive. If we didn't have a choice of the cheaper blue tape, I think we would still buy the blue painters tape instead of masking tape because it came up without any problems. Masking tape can sometimes be such a pain to work with. Buying the blue painters tape is a small expense in comparison to what the airport pays for the paint they purchase.

Straight Edge:

Get a 4 to 5 foot length of ½" x 3" board or door frame molding and a four foot long piece of 1" x 1" wood. Attach the 1x1 at the center of the ½" x 3", perpendicular to the 3" side to make a big "T" (3" side flat to the ground). The board can be laid down along the line, as a straight edge, held in place and the paint roller run along the board. This gives a good straight edge without having to tape.

Hats, Sunscreen, Long Sleeved Shirts, Bug Spray and Water:

Everyone should bring hats, sunscreen, sun glasses, long sleeved shirts, bug spray and water. They are essential for "survival" and preventing sunburn and dehydration. Do not forget that the sun can even burn through clouds and that the rays will reflect from white concrete.

Pavers or Rocks for Grass Strips:

It is difficult to paint on grass. One chapter used rocks to layout the airport name adjacent to the runway. Keep in mind, anything with the "Object Free Area" has to be less than 6 inches in height. Figure out your making as if you were going to paint and then determine how many pavers or rocks you would need to cover the same area.

Where to Get Supplies

Lisa Garrett, Shreveport Chapter, offered the following information on getting supplies. Look at the discount stores such as Big Lots or The Dollar Tree (paint rollers for \$1.00). She was not able to get the paint thinner at these stores. They used the "AWESOME" cleaner to help them clean their hands after airmarking. She says that it works well and costs \$1.00 per bottle at the Dollar Tree (maybe more expensive now). Lisa also recommends the blue painter's tape. She was lucky to pick up the blue tape at BIG LOTS - otherwise the tape is more expensive than masking tape. She says that "if we didn't have a choice of the cheaper blue tape, I think we would still buy the blue painter's tape instead of masking tape because it came up without any problems. Masking tape can sometimes be such a pain to work with. But buying the blue painter's tape is a small expense in comparison to what the airport pays for the paint they purchase."

Section 4

Safety and Environmental

Safety should be the primary consideration at all times while airmarking. The safety of your workers, the safety of pilots on the ground and in the air, and safe conduct pleases the airport manager.

The airport manager should put out a NOTAM stating the dates the airport is going to be painted and the runway, taxiway, or ramp to be painted. Ask the manager for cones or barriers to block off the area to be painted. Make sure a large enough area is blocked off to allow space to work.

When wet or damp, a painted surface has a tendency to be slippery. This should always be a consideration when deciding where to place the airmarking on the airport.

For the workers' safety, a radio tuned to the Unicom, ground or tower frequency should be within listening distance at all times. As always, do not rely wholly on the radio. Keep your eyes and ears open.

Chapters should get involved in requesting the marking of power lines. If there are power lines that need better identification for pilots, chapters should ask the airport manager or authority to contact the local power company.

Paint cans, with liquid paint still in them, are considered a hazardous waste. Try to empty cans as much as possible and let them dry before disposing. Normally, the airport will handle waste disposal.

SECTION 5

Laying Out the Letters and Compass Roses

The location of the airmark should always be confirmed with the airport manager. Keep in mind the requirements discussed in Section 2 for the placement airmarkings on Part 139 Certificated airports. Some of the instructions below may still refer to painting on runways and taxiways. This is not the preferred location; however, the techniques discussed can be still used.

Before laying out the airmark, find the center, vertically and horizontally, of the surface to be painted. The width of the taxiway can be measured with a 100' tape. The length is a little more difficult. Take a car to one end of the taxiway, check the odometer reading, and drive to the other end of the runway. Determine half of the distance driven and return only that far back down the surface. From 800' above or higher, no one will notice if the airmark is five feet from being absolutely centered.

Usually the outer edges of the taxiway or ramp are not clear; they seem to just fade into the dirt or grass. For this reason, a center line needs to be determined from which the letter lines can be made. A team of two people holding the 100' tape, one on each side of the taxiway or ramp, and one person with a chalk stick in about the center of the taxiway, should work their way down the taxiway or ramp putting a mark at the center point or desired distance from the edge of the ramp about every 20 feet. Teams with the chalk lines should then follow making chalk lines between the marks placed. Do this for the entire length of the area to be marked. If possible, keep airmarking at least 5 feet from centerline (above or below it). If letters must cross centerline, lay sign out in the least traveled area for less wear and tear.

Once the center line has been established, the tape measure team should start at one end of the area to be marked and, using chalk sticks, put marks about every 20 feet at the outer edges, inside which the letters will be laid out. If you are making letters 40' high, a third person holding the tape in the center should place the 20' mark on the center line just established and the two people on the ends of the tape will make a horizontal chalk mark at the beginning of the tape and at the 40' mark. Again, the chalk line teams should follow behind and place chalk line marks between the tape team's marks. You will now have the upper and lower limits of your airmark.

After determining where the downwind leg of the preferred runway is, whenever possible, face the letters so they can be read from that position while in the air.

Start at the center letter of the airmark, with the center of the letter at the center of the space to be marked. Then lay out the rest of the letters and numbers on each side of the center. By doing it this way, you will not run out of space or find that you are very off center.

When painting an airport name or identifier, it is most helpful, to pilots, if the elevation of the surface is part of your airmark, i.e.:

LOW HILL EL. 123Z

The elevation letters and numbers should be half the height of the letters for the name of the airport.

If you are organized and have your layout on paper in your hands, you will find the flow of laying the individual letters and numbers out will go reasonably smoothly. Use a clip board to help control the layout pages. This is especially helpful on breezy days. One chapter puts each letter's layout page on a piece of cardboard to help them control it. Have an overall layout page with the total distance to be covered shown. Individual pages for each letter's layout are not absolutely necessary but are very helpful.

Appendix 2 shows the letter sizes and spacing. As a minimum, letters for a taxiway or ramp should be 20' tall and for a roof, 10'. As a simple rule of thumb, use a 3' wide stroke for 20' high letters and a 5' wide stroke for 40' high letters. This allows you to cut a couple boards to these two lengths and use them to make the inside marks of each stroke on each letter. This saves the tape team's time.

SECTION 5

Laying Out the Letters and Compass Roses

The tape team should start at the beginning of each letter and make the marks for the start and end of the letter on the top and then the bottom chalk lines. It is helpful if you mark outside the top and bottom lines the letter being painted and the points where it starts and ends. This is very helpful to the teams with the templates, boards and chalk lines.

Many letters require measurements in the center areas, too, and these should not be forgotten by the tape team.

If rounded corners on the letters are desired, a template is most helpful. Instructions on making one and its use are in Appendix 2.

Some airmarkings do not have rounded corners on their C, B, S, etc., and read fine from the air. This is your decision, and each airmark should be considered on its own merit.

When planning an airmarking project, consider laying out the letters one day, and painting the next. It is easier on the workers to airmark in the cooler hours of the day and there is usually less air traffic early in the morning. When working on asphalt, feet begin to burn from the heated surface in the afternoon hours. Hot runways are usually harder to cover with paint than a cooler one. Some chapters have even made weekend projects of the airmarking with the workers flying in and staying overnight.

Some chapters will have the layout team arrive before the painters so that they can stay ahead of the painters. Others will have the layout done the day before the airmarking so that painting can start early and avoid the heat of the day.

If you lay out the letters one day and paint the next, or sometime later, use Dixon crayons to mark the corners of all letters so they will be easy to identify when painting. Chalk will wash off in a rain and wear off faster than the crayon.

AC 150/5340-1 (latest edition) must be used for laying out runway identification numbers and markings. At the time of posting, the current edition of this document is attached at the end of this manual in Appendix 6. The FAA has changed the design of letters and numbers from the ones that Appendix 2 shows for laying out airport names and identifiers. AC 150/5340-1M, dated 5/10/2019, is 175 pages long. Since, in the last 30 years, no chapter has contacted me about a request to actually paint runway numbers and lines, this AC is no longer included in the manual. If a chapter decides to take on a runway marking project, you must use the latest version of this AC for your guidance.

Directions for one compass rose layout are in Appendix 2. You can look at the links from the 99s website Airmarking section to see other compass rose designs. The technique for laying out the Mt. Shasta rose would apply for many of the other designs that chapters have used. Please note, AC 150/5300-13A, Appendix 6, in [Appendix 5](#) of this manual, has added general requirements to our compass rose design. Although we can still paint "our" type of compass rose, we still do have to meet the general requirements which include painting "MN" for the magnetic north radial and the headings, in three-digit form for all of the other 30° radials. Please see Appendix 2 for the sizing of these letters and numbers.

Although AC 150/5300-13A, Appendix 5, Figure A6-1 shows using two arrows to show the declination (variation) between true and magnetic north, Paragraph A6.5, c. sill says, "Mark the date of observation and any annual change in direction of magnetic north durably and legibly on the surface of the calibration pad near the magnetic north mark."

In Section 1, we mention getting the rate of change in variation when the survey is done for the compass rose. When you finish painting the compass rose, you paint this information beside it, in small letters (about 1 foot high), "Surveyed mm/yyyy". Add the appropriate variation and rate of change like they do for maritime charts – for example: "+0° 04'W/year" (meaning variation increases zero degrees four minutes west per year). The surveyor, US Geological Survey for your area or <http://www.ngdc.noaa.gov/geomag-web/#declination> should be able to give you this information. The person working on the ground to help swing a compass will be able to see these letters and numbers.

SECTION 5

Laying Out the Letters and Compass Roses

Airmarking Grass/Gravel Runways:

I have not heard of any other way, other than painted rocks, to mark at grass strips. However, I can offer this. I had an FAA airports person remind me that rocks could not be any higher than 6 inches, or they would be considered "obstructions" if the airport was a certificated airport (Part 139). I know of one chapter that marked an airport using rocks, the size of bread loafs adjacent to the runway.

Since rocks may not easy to come by, concrete paving stones might be a good alternate. They are flat and not too high to be an obstruction. If you set them in the ground slightly, you should be able to mow over them, so that they would remain visible. Better yet, see if the area can be prepared with weed retarding plastic with gravel on top, so that mowing around the pavers is not required.

SECTION 6

Painting

Most paint needs at least 50°F surfaces for the paint to dry properly. Try not to paint on days when the night before had temperatures below 50°F if at all possible.

Now that all those big letters and numbers or compass rose are laid out, all that is left to do is filling in between the lines.

Clean the area is again of all debris. Prepare rollers and attach the long handles. Line paint roller pans with aluminum foil. Prepare milk or bleach jug paint pots if you are using them.

Get the paint ready. Depending on the type of paint used, it may need thinning in addition to stirring. Always thin and stir the paint **off** the surface to be marked (or on the large sheet of polyethylene). That way any spills will not be noticed from the air. Some paints have a water base so thinning and clean-up only require water. Others need chemical thinners to work properly.

You should plan on painting the white paint first and then the darker color(s). This way, you can use the same paint rollers with the darker colors.

Once the paint is thinned and mixed, pour sufficient quantities in paint containers large enough to accept rollers (see Supplies, Section 3). The containers should be in an area to be painted before pouring paint into them. Then if any paint is spilled, it has fallen in the right place. The paint trays should be kept only in areas to be painted.

Experienced airmarkers should go ahead of "First Timers" and outline all letters with their rollers or brushes. Masking tape will give a sharper outline than hand painting. (See Section 3 for the Straight Edge suggestion.) However, this will only be noticeable if you are standing on the airmarking. With the letters outlined, be careful to stay inside the lines. Once a wrong stroke has been made, there is no way to erase it; neither water nor thinner can get it out of all the little grooves of asphalt or concrete. Sometimes black paint can be used to cover the "error" after the "error" is dry.

When applying the paint, remember that a thin coat is better than a thick one. Thick coats seem to crack more readily than thin coats of paint. By the time one thin coat is finished, the paint should be dry enough to accept another thin coat. If not, take a short break, you will probably need it. Keep in mind that highway paint dries very quickly.

Since the paint being used will probably be fast-drying there will be a tendency to walk on the painted areas. Some paint will get on the bottom of shoes. So another caution: watch where you walk and wear old shoes! You don't want to see foot prints the same way you see tire tracks after lines have been painted on a highway.

As each letter or number is completed, carry the paint tray to the next area to be painted. Don't drag it. This again keeps the paint where you want it. Also, remember to put down rollers only in areas to be painted. When leaning on them, watch where the roller is put.

All these warnings are not meant to scare you; they are to make you aware of the situation. Errors and mistakes are going to be made, no matter how careful you are. After all, we are human.

Once all required areas are painted, it is nice to sign your creation. This should be done small enough so that it is not legible from the air. You might use the superimposed 99 insignia, the numbers "99s" or create your own. When you are proud of the work you have done, you should show it. The 99s branding and copyright only permits The 99s logo in the center of the compass rose. It is perfectly acceptable to include the insignia of an organization that helps with the painting. Their logo or the airport name can be on the outside around or beside the compass rose, not in the center

SECTION 6

Painting

Clean up. Large plastic trash bags work nicely for empty, dry one-gallon paint cans or dry, used roller covers.

It is always a good policy to leave the area as clean as, or cleaner than, it was found. After all, how many times does an airport have a litter brigade to police the area?

The roller frames should be cleaned of excess paint so new roller covers will slide on them next time. Any item that you wish to reuse should be cleaned at this time, before they dry. It is best to dispose of the roller covers instead of trying to clean them.

Now it is time to celebrate a difficult task well done.

SECTION 7

Miscellaneous Suggestions

At airports that experience extreme temperatures at both ends of the thermometer, consider applying the paint in stripes instead of solid. This allows the pavement to breathe and helps prevent the paint from cracking. Use a 1" x 6' board for the open spaces between the painted stripes.

To recognize each member's work at airmarkings, give each their own roller stick. A piece of colored tape is wrapped around their stick each time they participate on an airmarking. This is sort of a civilian "battle ribbon" or "notch on a gun".

If airmarking a strip near a state line, include the name of the state in addition to the name of the airport. In most cases, just the abbreviation of the state's name should suffice. You need not paint CALIFORNIA on a 2500' strip. Use "(airport name), CA".

If more workers are needed to help your chapter airmark, contact nearby chapters or other Ninety-Nines in the area. If there is an air museum on the field, their members might also be interested in helping. Local EAA Chapters and airport support organizations and even a Scout troops have participated in airmarkings.

One chapter in the Southwest Section needed to airmark an airport, for identification purposes, for an air race. The area airmarked was not a hard surface; it was gravel. Neither rollers nor brushes would do the job. They ended up paint sweeping the name of the airport on the surface. The airmark was legible for a long time.

Another chapter spelled out the airport's name in 1 foot rocks that had been painted white. The area the rocks were placed had been cleared of grass, with weed retarding plastic and small stone placed by the airport management. The chapter and a local farmer provided the rocks and the chapter did the painting and setting. They advertised this as a "rock party". Just make sure that the rocks are not in the runway safety zone – within 250 ft. of the runway centerline and from the threshold. Anything within the runway safety zone must be less than six inches high.

We have received a message from one user of our compass rose requesting the continuation of the N-S and E-W lines through the center circle. This makes it easier for a small plane to line up by putting its nose on the N-S line and placing the main wheels on the E-W line.

If the area where the compass rose is going is badly stained, the oil and fuel stains will come through the paint. It might even cause streaks in the paint, especially if you use oil paint. I am not sure of the best way to clean the area. A power wash with detergent might actually loosen the aggregate in the asphalt because the asphalt cement (a petroleum product) has been damaged (soften/dissolved) by the oil/fuel that is staining it. A good asphalt seal coat, painted over the stained area would probably be the best bet. I also think that you would want it to weather a month or so before painting on it. I.e., do not paint over the next day. Maybe the seal coat manufacturer (not the applicator) will tell you that you can paint one or two days later. I have seen them repaint parking lots a day or after seal coating them. You also might just want to roll the paint in one direction and only one time. Going back and forth in the same spot will also bring the staining to the top.

SECTION 8

Rooftop Airmarking

Airmarking on roof tops is not too popular in some areas, and is well received in others. As there are more restrictions on painting on taxiways and ramps, some airports might want painting done on roofs. There are definitely safety considerations related to fall prevention: working on a surface without hand rails more than four feet above ground level; access to the roof; roof slope and proximity to edge of roof. This needs to be discussed in detail with the airport operator.

In general, airmarking roof tops is not too different from airmarking runways and ramps. However, there are some differences. Therefore, we will be referring to earlier pages in this guide as well as offering new suggestions.

Who To Contact

Determine what might be a good location for an airmarking by flying over the area and observing the buildings and their rooftops -the flatter the roof, the easier to paint. Then contact the owner of the building for permission and information. Don't forget to find out how old the roof is. If it is due for replacement soon, wait until later, or pick another roof.

If the owner is receptive to the idea of having his/her roof airmarked (you have by now explained the value and necessity of rooftop airmarkings) and the roof seems to be suitable (flat enough for safety of those doing airmarking, new enough not to need replacement soon, etc.) then you must get a letter of permission from the owner. An adaptation of the letter on page 4 would be good. You need this letter for legal reasons, and it also transmits a professional attitude to the building owner.

If the roof surface is made of asphalt or composition materials, i.e., a typical flat roof, see if you can find who installed and the manufacturer of the roofing materials. Contact the manufacturer to determine the suitable type of paint to go on the roof materials. Do not be surprised if the paint is expensive.

Materials Needed

Steel tape measure (at least 20 feet, preferably longer), chalk line, template (homemade), chalk, paint brushes and paint rollers (see Section 3 for descriptions).

Paint can be yellow, aluminum, or black, depending on the type and color of the roof to be marked. Naturally, you will want to use a color that will contrast as much as possible with the roof color.

Paint required:

For slate, tin, or metal roof - one gallon of paint will cover approximately 8 10-foot letters;

For asphalt or composition roofs with porous surfaces - one gallon of paint will cover approximately five 10-foot letters;

For asphalt roof, use primer coat of aluminum paint to keep asphalt from bleeding through the yellow paint. Primer coat prevents damage to roof from the solvent in the paint.

Laying Out the Letters

First, determine the approximate size of the roof so that the letters can be centered as much as possible. This is done by measuring the roof with a tape or stepping it off. Several reference lines should be laid out by measuring several points equidistant from the sides of roof and laying a chalk line. Then, measure 10 feet down from the top line on both sides and with the chalk line make the second reference line.

Now begin laying out the letters according to the instructions for ten-foot letters in Appendix 2.

SECTION 8

Rooftop Airmarking

Painting the Letters

See Section 6 for suggestions on painting.

Miscellaneous Suggestions

Do not attempt to paint if temperature is less than 50°F because paint will not dry properly.

Do not paint if roof is wet. The paint will not stick; the chalk lines will run, and workers may slip and be injured.

Ten-foot letters are usually sufficient for rooftops.

A circle with an arrow pointing toward the nearest airport might be just what a lost pilot needs. If known, putting the distance in miles to the airport would be helpful. The distance could be painted inside the circle. A circle is the signal for an airport in almost all areas. If this is not feasible, the name of the town, even one without an airport will enable a lost pilot to find his or her way back on course.

Don't forget to take along some large garbage bags to collect the debris during and after painting. Remember to leave the site cleaner than you found it.

Old tennis shoes would be the best footwear for this type work. They will not hurt the roof; people will be more sure-footed, and a little paint on them would not hurt. Old clothes are the order of the day, too, since we all get a little messy around paint.

Make sure that your supplies, drinking water and snacks are brought up on the roof when first going up. It may be difficult to go up and down during the marking work.

SECTION 9

Reporting Your Airmarkings

Chapters are requested to report on their Airmarkings annually. Please send a report to your Section and the International Airmarking Chairs. Some sections have a competition among the chapters on the amount of airmarking done, it is best to report in two ways: (1) number of airmarkings done and (2) total square footage your chapter airmarked during the year. For letters, this is computed by multiplying the height by the width of each letter/number painted. For compass roses, the Excel spreadsheet that is available can be used. Remember if any member of your chapter has helped another chapter airmark, both chapters can receive credit.

Report all airmarkings: informational signs, runway markings, airport name on ramp, building, roof, etc., and compass roses painted. Your section airmarking chairman will have established a method of counting and giving credit for all these if your section has an airmarking competition. Also, the International Airmarking Chairman will want to include chapter airmarking information in her report for the annual business meeting.

The International Airmarking Chairman must submit her report to Ninety-Nine Headquarters for duplication no later than June 1 each year. Therefore, it is requested that all chapters report their airmarkings to their Section Airmarking Chairman by April 15, so that she can compile her report and send it to the International Airmarking Chairman by May 1. This would make our Airmarking year run from April 1 through March 31 each year.

In reporting your chapter airmarkings the following is needed:

1. Type of Airmarking (runway, ramp, taxiway, rooftop, informational, compass rose, etc.)
2. Location (airport, town).
3. What did you paint? (name, numbers...)
4. Size of numbers or letters.
5. Square footage painted (if Section has competition only) – The International Airmarking chairman has created an Excel spreadsheet to use for calculating the area painted on a compass rose. It is available on request.
6. Date painted.
7. Is it a new airmarking or a remark?
8. Did any other organization help with your airmarking?

Don't forget to include the chapter name. We want to give you the credit you deserve!

If you do not know who the International Airmarking Chairman is, check your Ninety-Nine Directory or The Ninety-Nines website: www.ninety-nines.org. If you don't know who your Section Airmarking Chairman is, check with your governor; she can tell you.

One more thing - **TAKE PHOTOGRAPHS!** The Editor of *Ninety-Nines News* loves to get news items about airmarkings with photos. Make sure you identify the location and people in the photos. The International Airmarking Chairman would also like photographs that can be included as back up information with her annual report and that can be sent on to Headquarters.

Appendix 1

99s Airmarking Information FAQ

What would be required to have our airport airmarked?

Make a request to the local 99s Chapter. The International Airmarking Chairman can get you started by finding a local contact.

Determine what type of airmarking you want to have - airport name, elevation and frequency, compass rose - and its location. If your airport is a Part 139 certified airport, then the marking must be in a non-traffic area and meet the centerline clearance requirements for traffic areas such as taxiways. If your airport is not Part 139 certified, then there is a little more leeway on marking locations, although the preference is to still have the markings in non-traffic areas if possible.

The 99s require that the airport/FBO have the survey done for a compass rose. The survey must be based on magnetic north and each 30 degree radial must be marked. Survey should be done by a licensed surveyor or engineer qualified to do this kind of survey. Please review AC 150/5300-13A, Appendix 6, Para A6-4.d and e, latest revision for the suggested method for doing the survey. We will also need the date of the survey and annual rate of change in declination/variation as we are required to paint this information adjacent to the compass rose.

We also have a simple indemnification statement that we would like you to give us. "The [your airport name] agrees to indemnify, defend or hold harmless The Ninety-Nines from any damages or injuries of whatever nature or kind to persons or property arising directly or indirectly from The Ninety-Nines, Inc, airmarking on the airport." This statement would need to come from the airport operator/owner.

What is the procedure to initiate an airmarking project at your airport?

Contact the Chapter Chairman to make sure their chapter is the closest to your location. If they recommend a different chapter, they should be able to give you the contact information. If not, please get back to the International Airmarking Chairman.

What materials would be required?

We ask the airport to provide paint and thinner (if oil based paint is used). Typically, highway marking paint is the preferred type. Normally we use white and handicapped blue with maybe a little black to be an "eraser" if working on asphalt. We will need to know the manufacturer of the supplied paint so that we can check the painting specifications. Ninety-Nines chapters use brushes and rollers, not spray equipment.

The 99s Chapter will normally supply the rollers, paint, tape and other things necessary to lay out the markings.

Sometimes the airport operator/FBO will also supply non-alcoholic beverages or lunch for the painters - this is entirely optional.

How long does it take?

Painting time depends on what is being painted, the weather and how many volunteers we get to do the work. Eight to ten people can do a compass rose in a long day. I prefer to lay out the compass rose the day before with two or three people (several hours work) and then be ready for the painters the next day - starting at 8-9AM. Airport name/identifier, elevation and frequency can normally be done in a day. Again, it works well if the layout can start the day before, just so that painters can start to work when they arrive on the painting day.

Weather can be an issue - if it is really hot and sunny, folks may not be able to paint all or part of the day.

Appendix 1

99s Airmarking Information FAQ

When can I get an airmarking done?

You will have to talk with the 99s chapter about this question. If they are willing to do the airmarking, they will have to put it in their activities schedule and coordinate with the airport to find a mutually agreeable time.

How are compass rose designs determined?

Typically, we paint a 12-point compass rose that is 80 feet on the cardinal points. I have had chapters report everything from 40 to 100 foot roses. Size will depend on the space available and the size of the airplanes that might use the rose. You really do not want the compass rose extending into a taxiway or interfering with the use of a taxiway. If you go to <http://www.ninety-nines.org/airmark.html> and scroll to the bottom of the page, you will see links to several different compass roses that have been painted.

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APPENDIX 2

Layout Details

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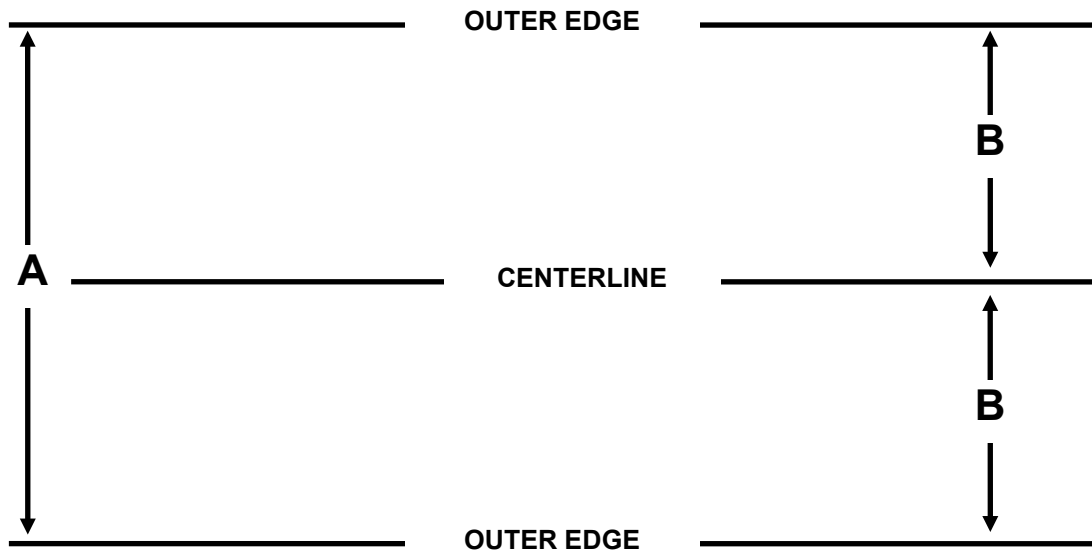
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Appendix 2

Layout Details

Establishing the Centerline of a Taxiway

1. Measure the width of the taxiway (A).
2. Divide the total width number in half ($A/2 = B$).
3. Measure from the outer edge of the taxiway using (B), to establish the centerline of the runway. Mark every 10 to 20 feet. Use chalk line or use a board with chalk to draw a line to connect the marks.
4. To paint the centerline of a runway. Follow Advisory Circular AC 150/5340-1 (latest edition), for length and width of stripes and gaps.



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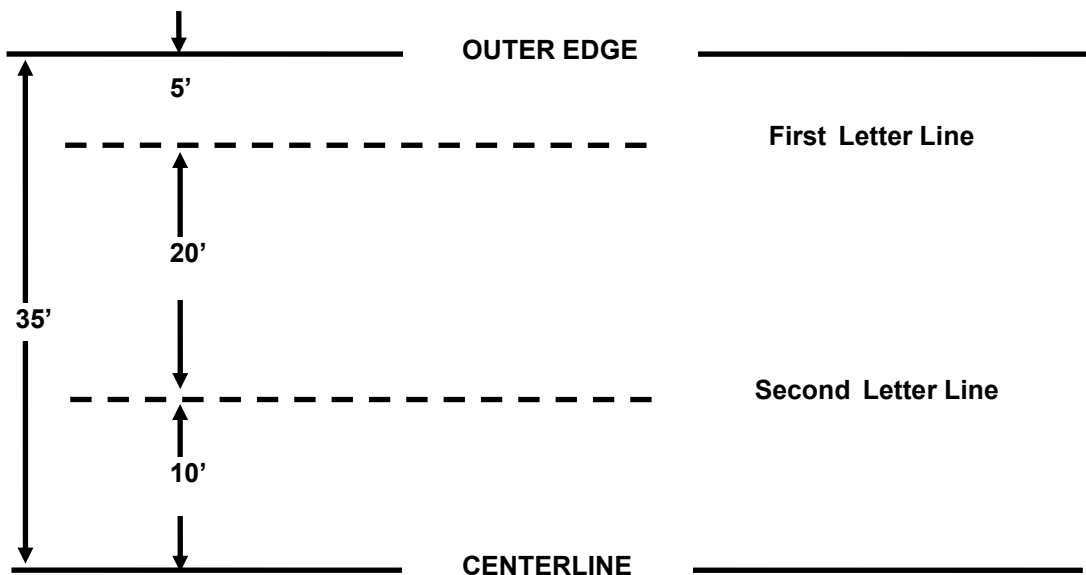
Appendix 2

Layout Details

Establishing the Letter Lines

(When the centerline is established)

1. The distance between the outer edge and the centerline is the length which determines the height of your letters.
2. In the example below, the distance measured 35 feet. With 20 foot letters and allowing 10 feet for center of the taxiway for traffic.
3. To start drawing the first letter line, measure 10 feet away from the centerline, make chalk marks at 10 foot intervals, align a long board or chalk line and draw line.
4. To get the second letter line, measure the height of the letters (20 feet) from the first letter line. Repeat as in Step 3 for drawing in the letter line.
5. When the top and bottom letter lines are drawn in the full length of the airmarking, the perpendicular line can be established for the left side of the first letter. See pg. 29.



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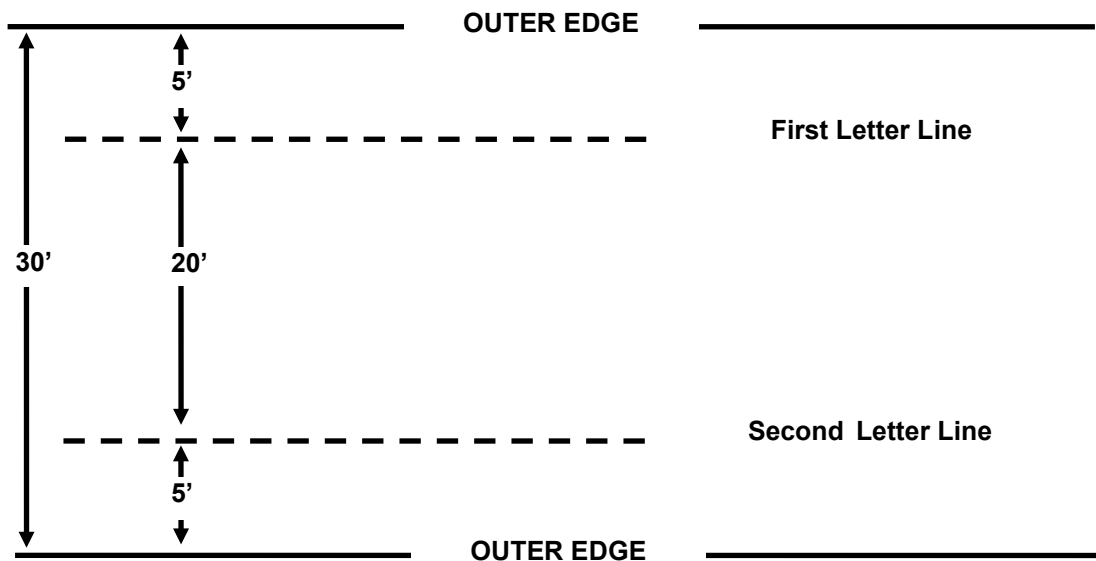
Appendix 2

Layout Details

Establishing the Letter Lines

(When no centerline is present)

1. Measure the width of runway or taxiway.
2. Allow 5 feet as the minimum distance in from each outer edge.
3. The distance between these two measurements will determine the size of your airmarking letters.
4. To start drawing the first letter line, measure 5 feet in from the outer edge of the runway, make chalk marks at 10 foot intervals, align a long board or chalk line and draw line.
5. To get the second letter line, measure the height of the letters (20 feet) from the first letter line. Repeat as in Step 4 for drawing in the letter line.
6. When the top and bottom letter lines are drawn in the full length of the airmarking, the perpendicular line can be established for the left side of the first letter. See pg. 29.



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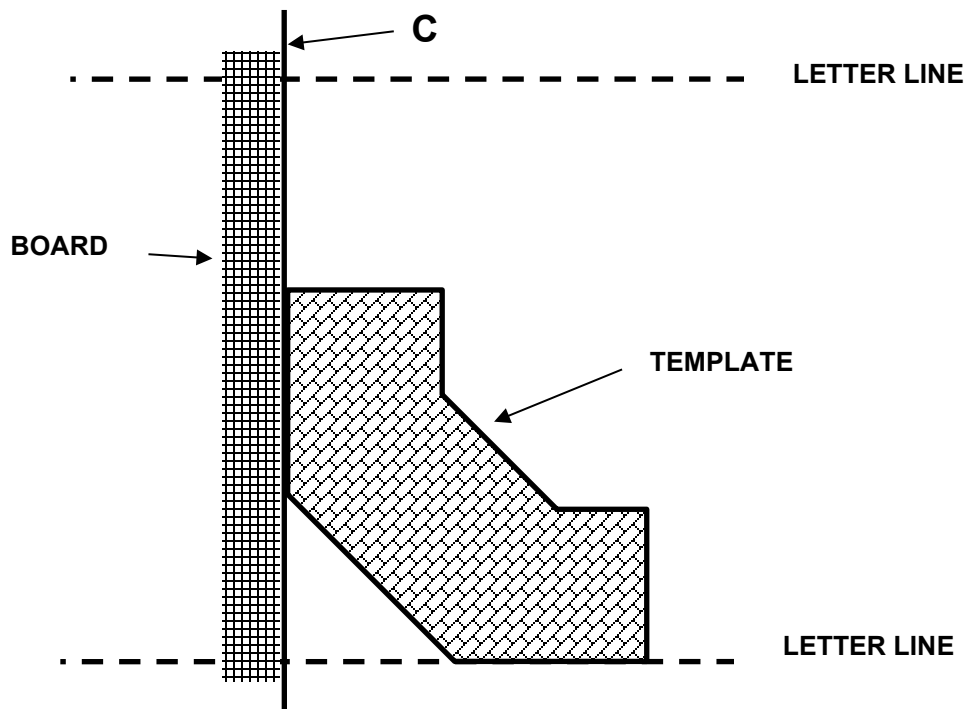
Appendix 2

Layout Details

Establishing Perpendicular Lines

(First line of the first letter)

1. The left side of the first letter must be a perfect 90° angle to the letter lines. The lay out of the letters for the airmarking will start from this line and the entire sign will depend on this line being perfect.
2. The method shown below is one of the many ways to accomplish this.
3. Lay the corner template on one of the letter lines.
4. Align the twelve foot board along the outer edge of the template.
5. Draw the perpendicular line along the edge of the board, (C).



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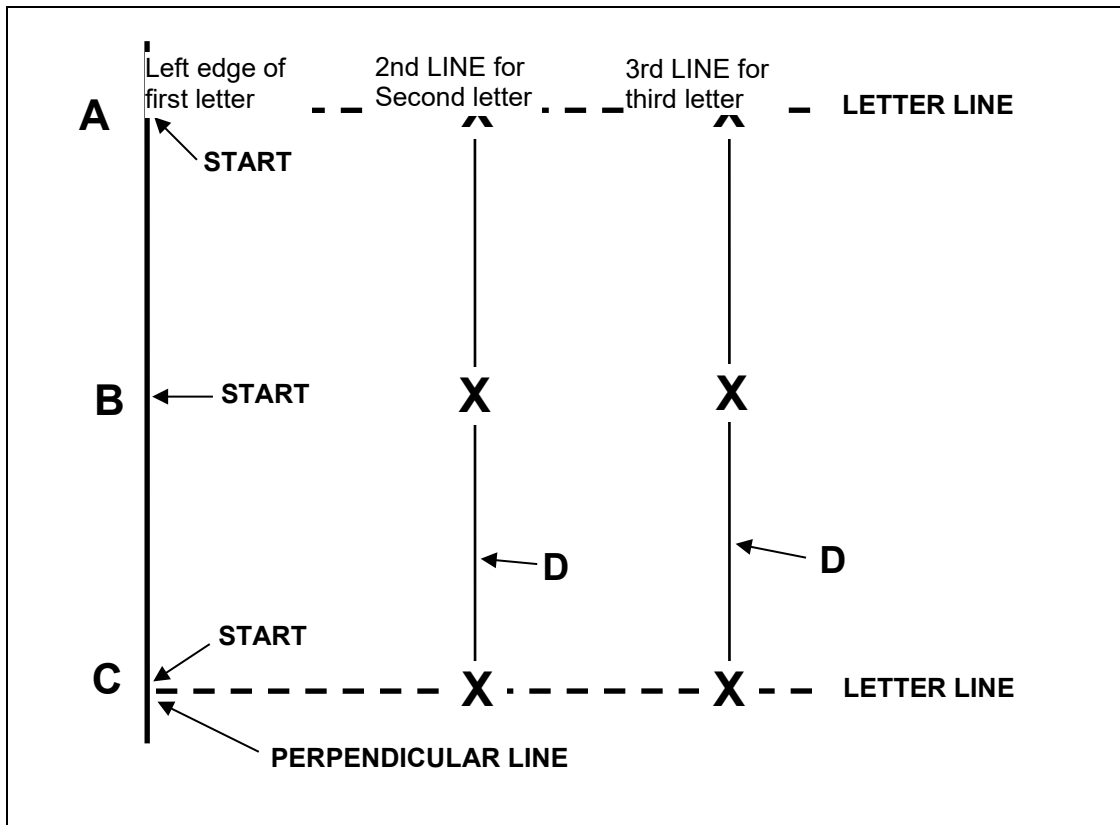
Appendix 2

Layout Details

Measuring the Letters And Spaces Along Letter Lines

Contact the International Airmarking Chairman for a copy of a Visual Basic program and instructions that will do this letter spacing. Program was written by husband of Heather Hill, Eastern Pennsylvania Chapter.

1. A simple list of measurements taken from the lay out drawing (see sample) should be used with one person calling out the measurements.
2. Placement:
 - a) Two people stationed on first letter line. (A)
 - b) Two people stationed on second letter line. (C)
 - c) Two people stationed in center of both lines (B)
3. Starting at the perpendicular line (first line of first letter). Make a chalk 'X' at each measurement called out.
4. When the first measurement is completed (first letter, the people handling the boards or chalk line should align them to the perpendicular 'X' marks and draw in lines (D). These lines are the left edge of each letter.



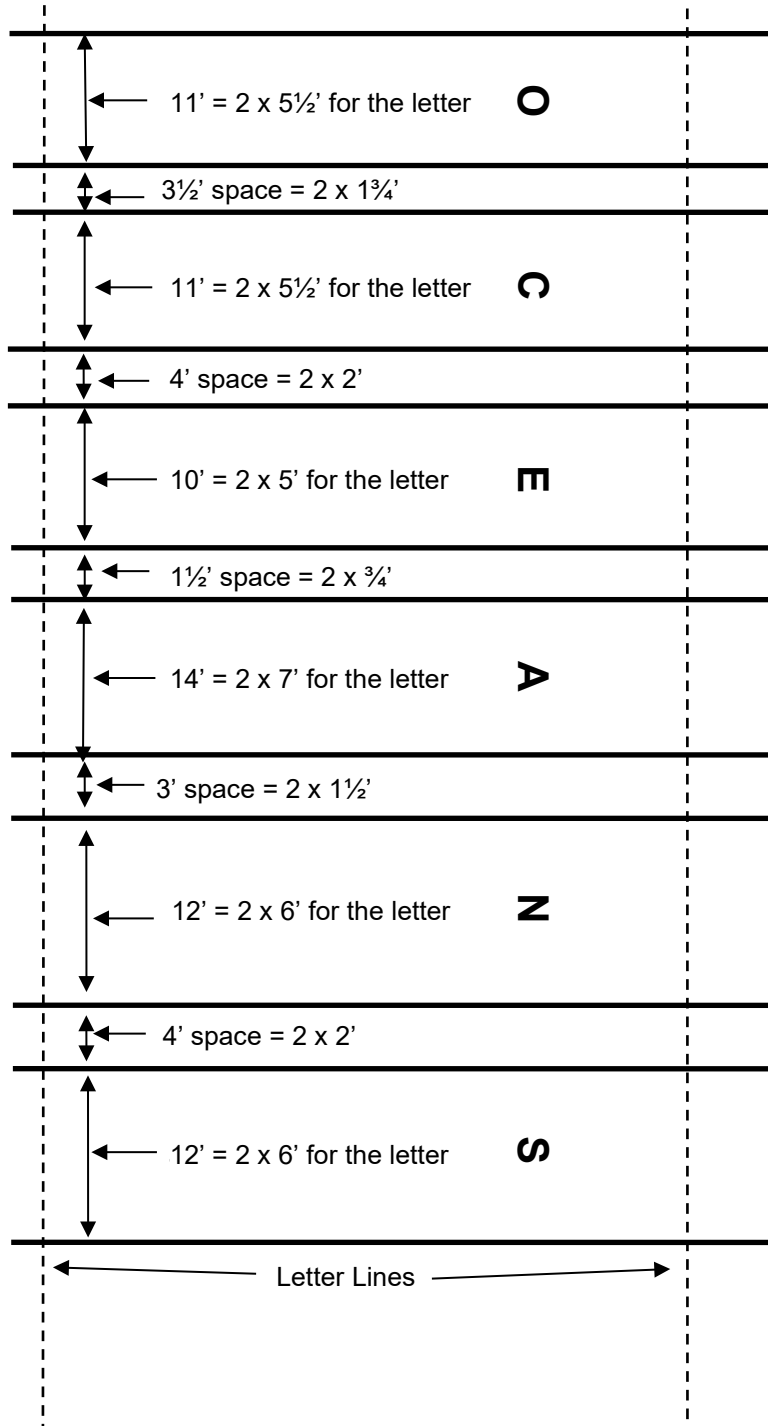
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Appendix 2

Layout Details

**Example of Lettering Measurements and
Layout of Perpendicular Lines**

The following demonstrates how to lay out the name "OCEANS" using the measurements for 20 foot high letters.

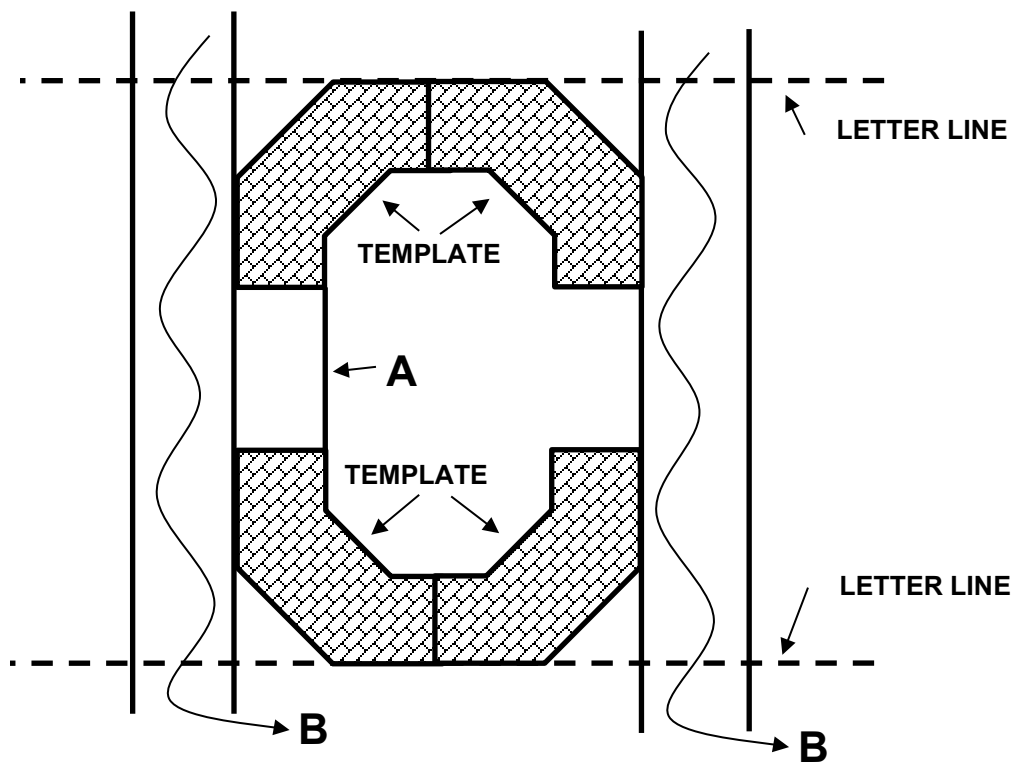


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Appendix 2
Layout Details
Drawing Letters

1. Use pre-cut templates and 12 foot boards or chalk lines.
2. With templates aligned to the outside line of letter box, make chalk marks at convenient distances. After removing template, align board or chalk line to marks and draw in lines 'A'.
3. To eliminate confusion, make wavy lines down through the space area between letters, 'B'.

The paint team should be preparing the paint to be used. When the first letter is laid out, the painting team should start their painting.



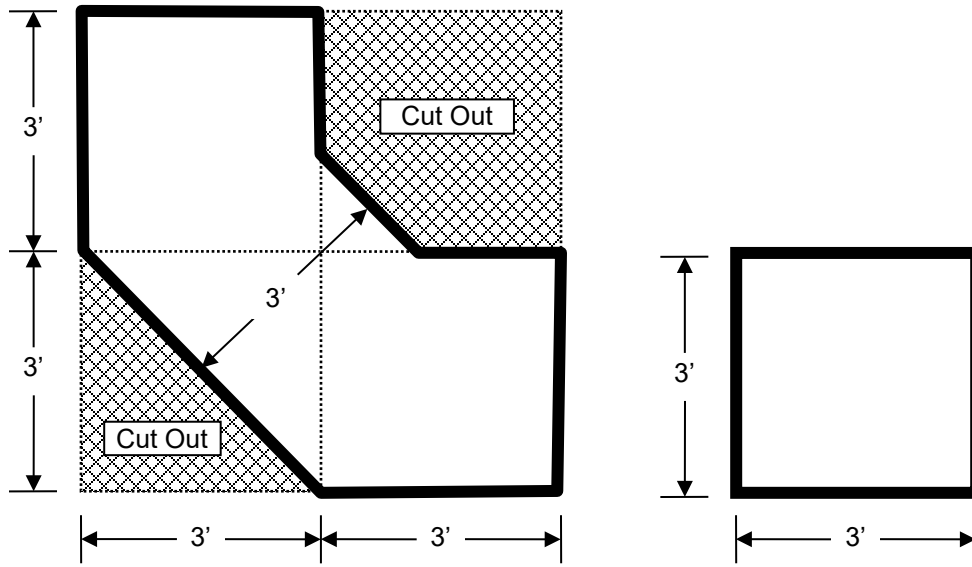
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Appendix 2

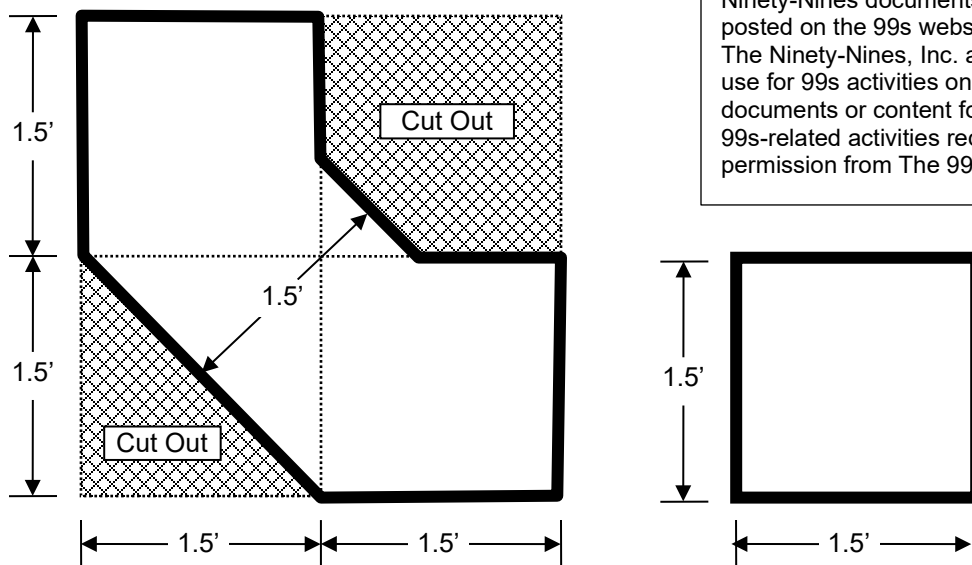
Layout Details

Corner Templates

20-Foot Letters and Numbers



10-Foot Letters and Numbers



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Appendix 2

Layout Details

Size of 'Stroke' or Width of Legs for Letters and Numbers

A twenty-foot letter will have a stroke of 3 feet (3 squares).

A ten-foot letter will have a stroke of one and one-half feet (1 and 1/2 squares).

A seven-foot letter will have a stroke of one foot (1 square)

Spacing

Where the name of the town or city or airport consists of two words (as Van Nuys), 5 feet shall be left between the two words if the letters are ten feet tall, 10 feet should be left between words if the letters are twenty feet high.

In the abbreviation of the states as in S.D. (South Dakota), there shall be 1 and 1/2 feet between the S and the period. The period shall be 1 and 1/2 feet in width, and the space between the period and the D shall be 1 and 1/2 feet (for a ten-foot letter).

Instructions for Using Key For Determining Spacing of Numbers and Letters

The purpose of the key for determining the spacing of letters is to simplify the lay-out of an airmarking and to insure good spacing between both letters and numerals. See the table on the next page.

To determine the number of feet between A and N, find A on the left hand side of the page. Then follow that column to the right to the letter N. Follow that column upward to the top of the page where the answer, 1 and 1/2 feet is found. This means that there shall be one and one-half feet between A and N. The same method is used in determining the spacing of numerals.

In using this key, letters and numerals will be perfectly spaced and any chance of running letters together, which might cause a blur from the air, will be eliminated.

Remember the letters, numerals, and spacing key are all given for ten foot letters in units of feet. For a twenty-foot letter you must double all figures given in this manual.

NOTE: Portions of this manual have been taken from the Air Marking Magazine, U.S. Department of Commerce, Civil Aeronautics Administration (1946), U. S. Government Printing Office, Washington, DC. See AC 150/5340-1 (latest edition) for runway numbers and letter layout.

Appendix 2

Layout Details

Key For Determining Spacing of Numbers

Feet Between 10' Numbers – Double for 20' Numbers						
Number	2.5	2.0	1.75	1.5	1.0	.75
1	1	2 3 4 5 6 8 9 0		7		
2		1	2 3 5 6 8 9 0	4	7	
3		1	2 3 5 6 8 9 0	4	7	
4		1		2 3 4 5 6 8 9 0	7	
5		1	2 3 5 6 8 9 0	4	7	
6		1	2 3 5 6 8 9 0	4	7	
7				1	2 3 4 5 6 8 9 0	7
8		1	2 3 5 6 8 9 0	4	7	
9		1	2 3 5 6 8 9 0	4	7	
0		1	2 3 5 6 8 9 0	4	7	
Feet & inches	2' 6"	2' "	1' 9"	1' 6"	1' 0"	0' 9"

Air Marking Magazine, U.S. Department of Commerce, Civil Aeronautics Administration (1946), DR A-4324-27

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Appendix 2

Layout Details

Key For Determining Spacing of Letters

Feet Between 10' Letters – Double for 20' Letters										
Letter	2.5	2.25	2.0	1.75	1.5	1.25	1.0	.75	.5	0
A					BDEFHI KLMNPR	U	CGO QSZ	AX	JT W	V Y
B			BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V		
C			BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V		
D			BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V		
E				BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V	
F						BDEFH IKLMN PR	U	CGOQ S TVWXY Z		AJ
G			BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V		
H	BDEFHI KLMNPR	U	CGO QSZ	X	AJT WY	V				
I	BDEFHI KLMNPR	U	CGO QSZ	X	AJT WY	V				
J		BDEFHI KLMNPR	U	CGO QSZ	X	AJT WY	V			
K				BDEFHI KLMNPR	U	CGO QSZ	X	AJT WY	V	
L						BDEFH IKLMN PR	U	ACG O QSZX	J	TV W Y
M	BDEFHI KLMNPR	U	CGO QSZ	X	AJT WY	V				
N	BDEFHI KLMNPR	U	CGO QSZ	X	AJT WY	V				
O			BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V		
P					BDEFHI KLMNPR	U	CGO QSZ	TVW XY	AJ	
Q			BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V		
R			BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V		
S			BDEFHI KLMNPR	CGO QSU	Z	X	AJT WY	V		
T					BDEFHI KLMNPR	U	CGO QSZ	TVW XY	A	J
U		BDEFHI KLMNPR	U	CGO QSZ	X	AJT WY	V			
V						BDEFH IKLMN PR	U	CGOQ STVWX YZ		AJ
W						BDEFHI KLMNPR	U	CGO QSZ	TVW XY	A J
X				BDEFHI KLMNPR	U	CGO QSZ	X	AJT VWY		
Y					BDEFHI KLMNPR	U	CGO QSZ	TVW XY		AJ
Z			BDEFHI KLMNPR	U	CGO QSZ	X	ATV WY	J		
Feet & inches	2' 6"	2' 3"	2' 0"	1' 9"	1' 6"	1' 3"	1' 0"	9"	6"	0"

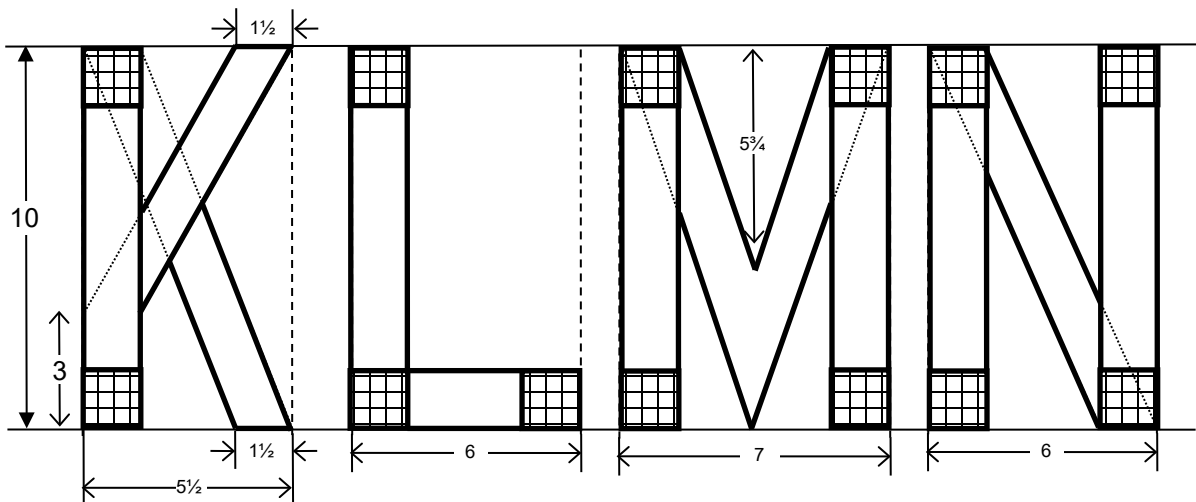
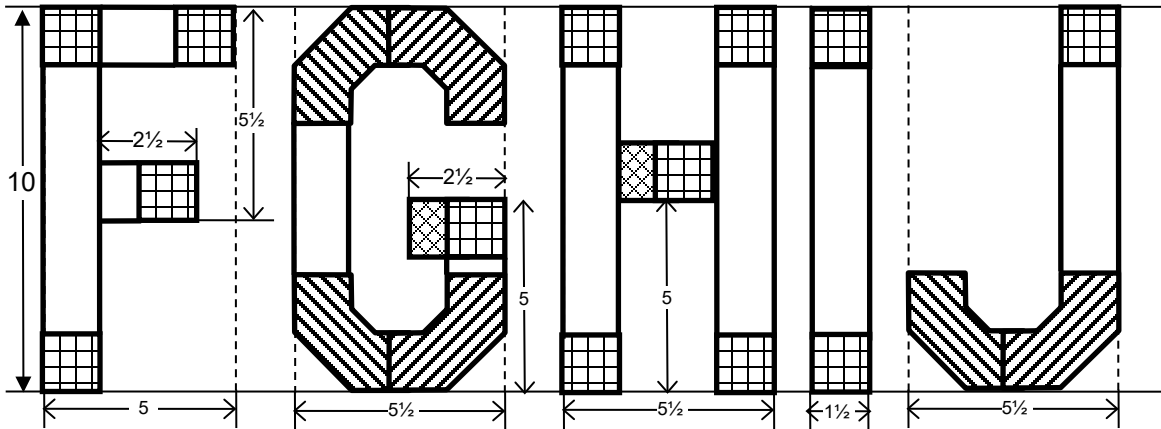
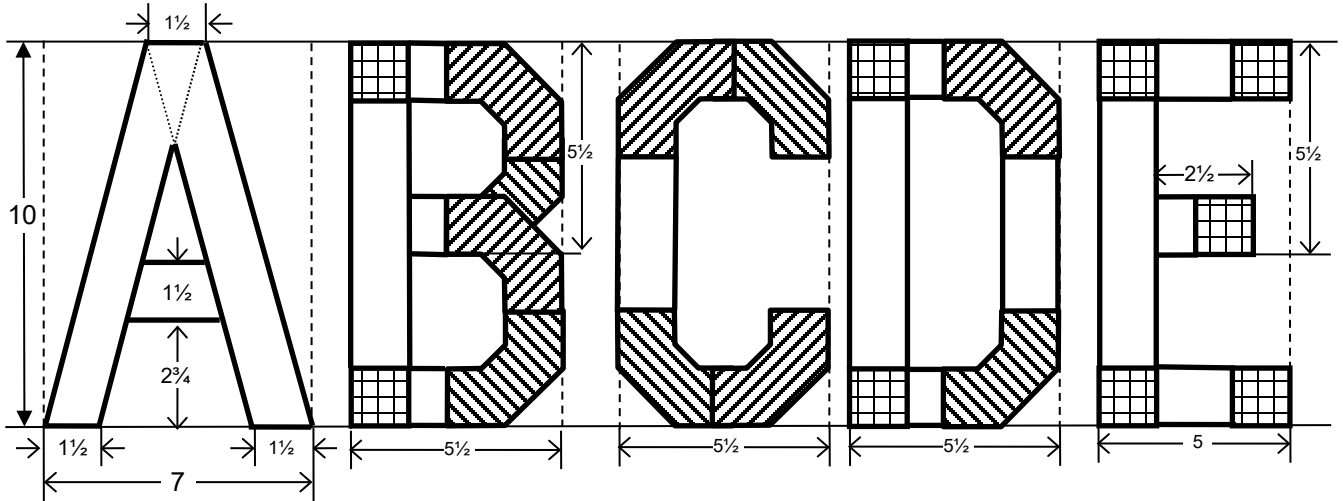
Air Marking Magazine, U.S. Department of Commerce, Civil Aeronautics Administration (1946), DR A-4324-26

Appendix 2

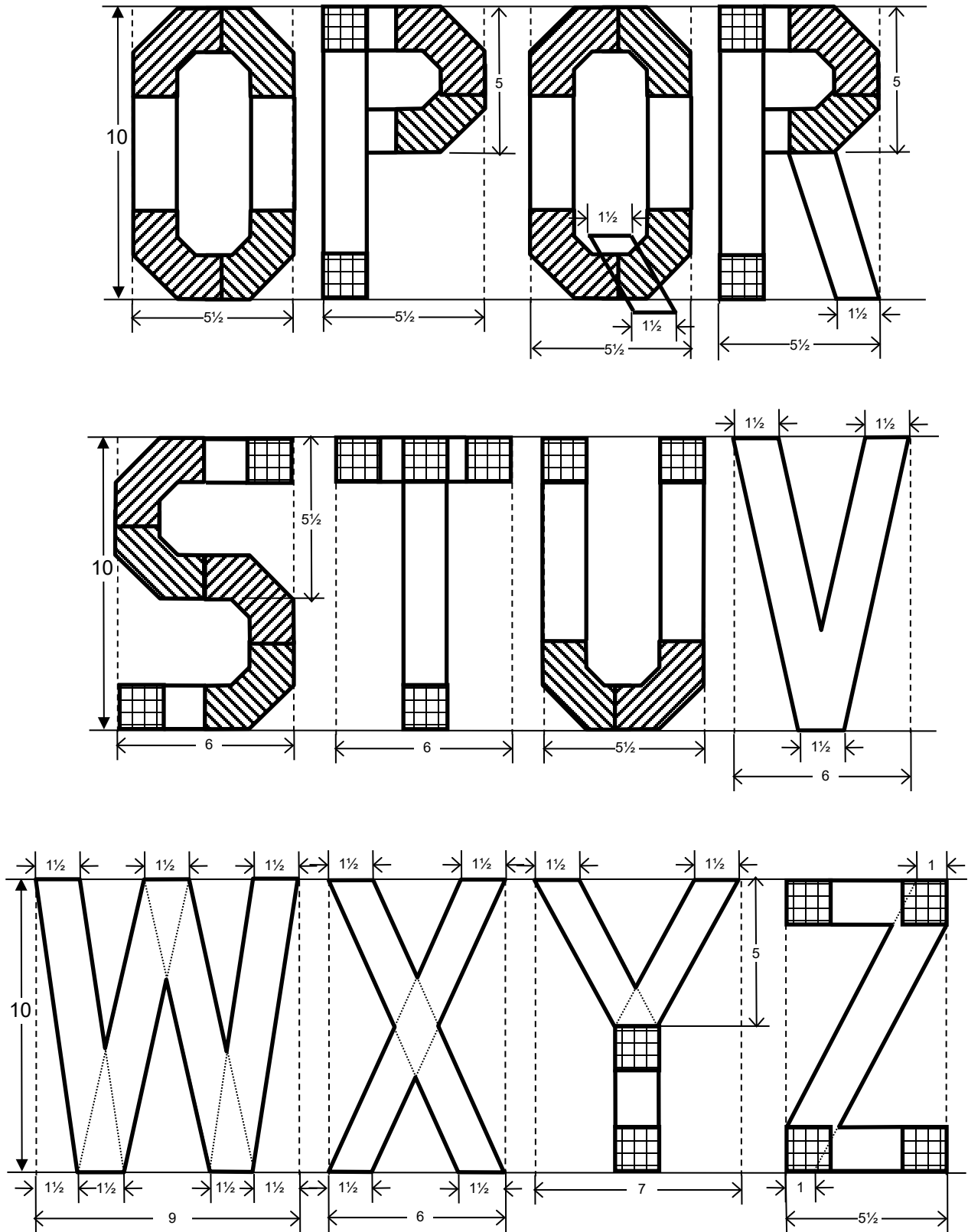
Layout Details

Layout for Ten Foot Letters

Note: All dimensions are in feet. For 20 foot letters, double all dimensions.



Appendix 2
Layout Details



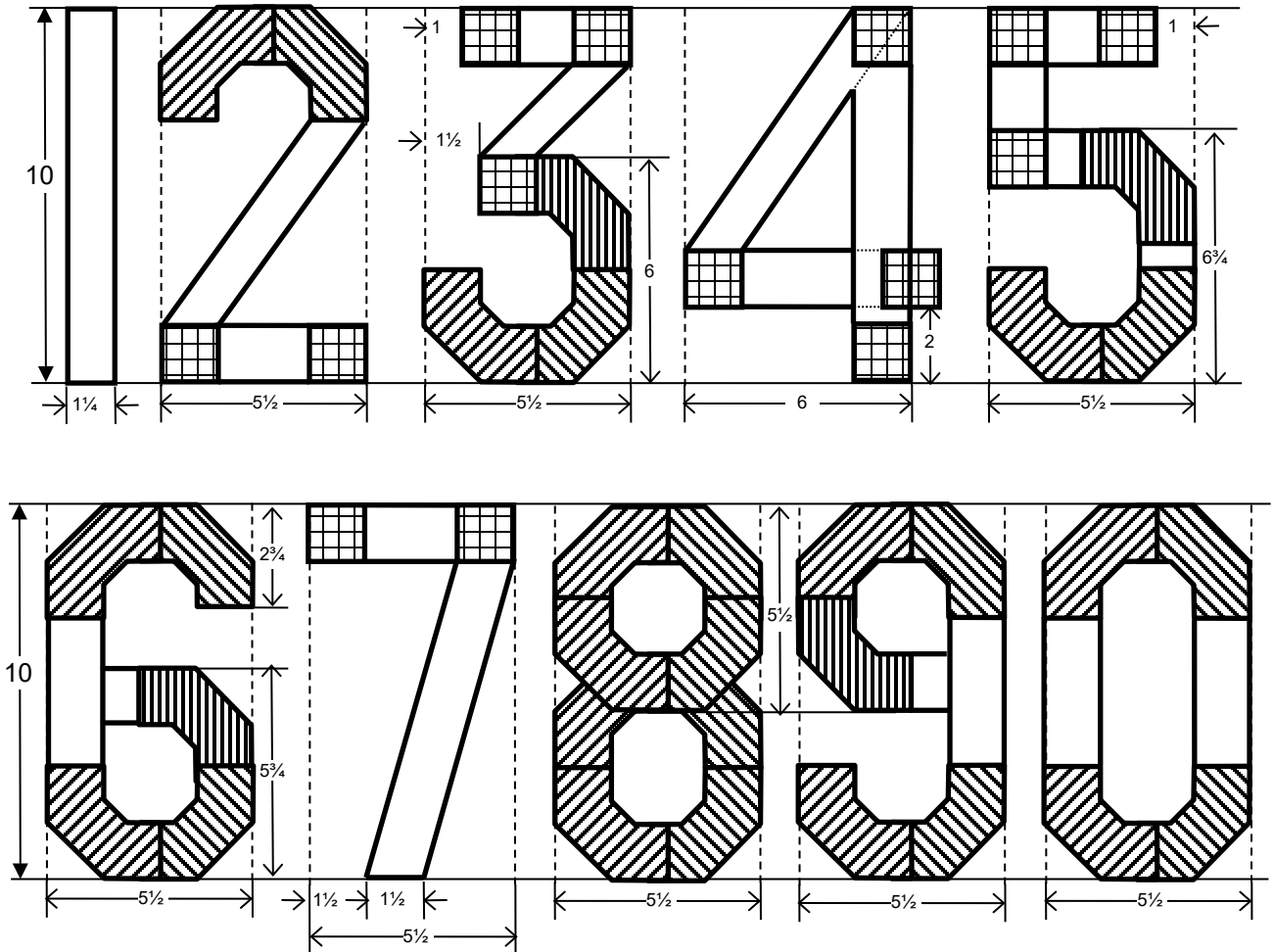
See Advisory Circular AC 150/5340-1 (latest edition), Fig. 4 for letters used for runway designation numbers.

Appendix 2

Layout Details

Layout for Ten Foot Numbers

Note: All dimensions are in feet. For 20 foot letters, double all dimensions.



See Advisory Circular AC 150/5340-1 (latest edition), Fig. 4 for letters used for runway designation numbers.

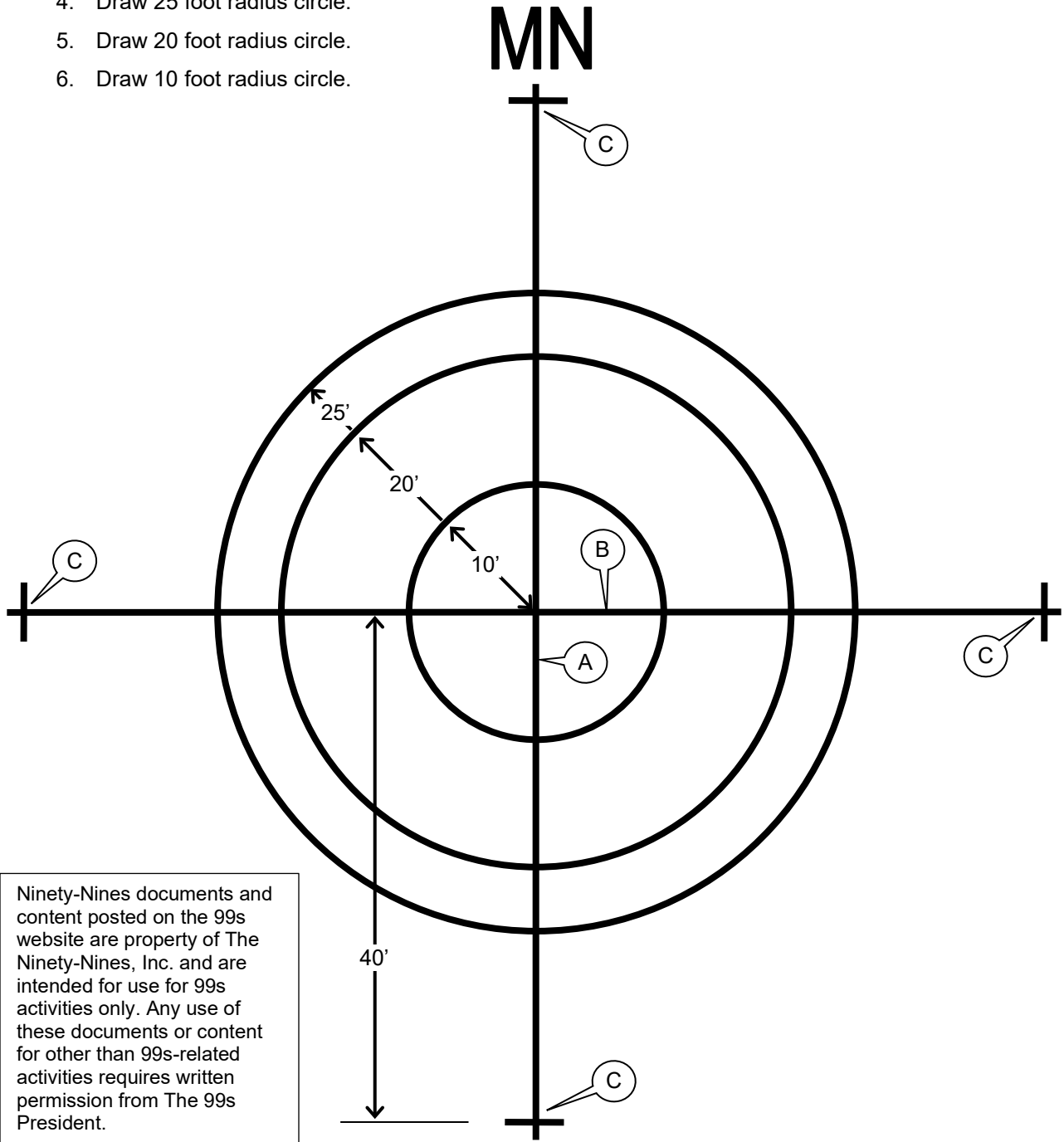
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Appendix 2

Layout Details

Mt. Shasta Compass Rose Layout - 1

1. Snap N/S line using chalk line. Make longer than 80feet. "A"
2. Snap E/W line using chalk line. Make longer than 80 feet. "B"
3. Mark the N/E/S/W lines 40 feet from the center. "C"
4. Draw 25 foot radius circle.
5. Draw 20 foot radius circle.
6. Draw 10 foot radius circle.



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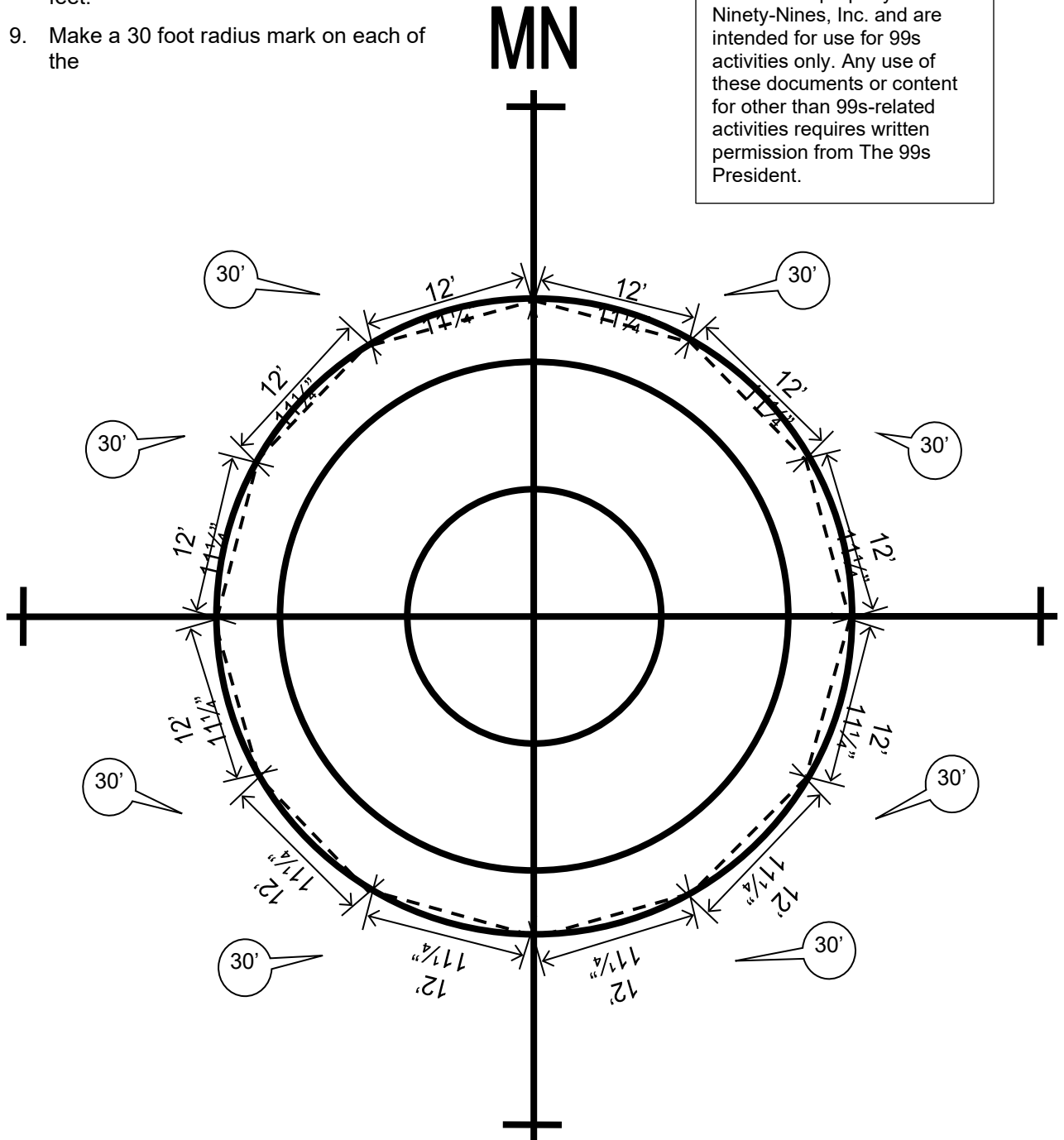
Appendix 2

Layout Details

Mt. Shasta Compass Layout - 2

7. Mark 12' 11¼" cords on the 25 foot radius circle, starting from the 'N' line. If you do not "close the circle" with your 12th cord, measure the distance remaining, divide by 12 and add to the 12' 11¼" and remark.
8. Snap eight 30 degree lines from the center of the circles through the cord marks. Lines should be longer than 30 feet.
9. Make a 30 foot radius mark on each of the

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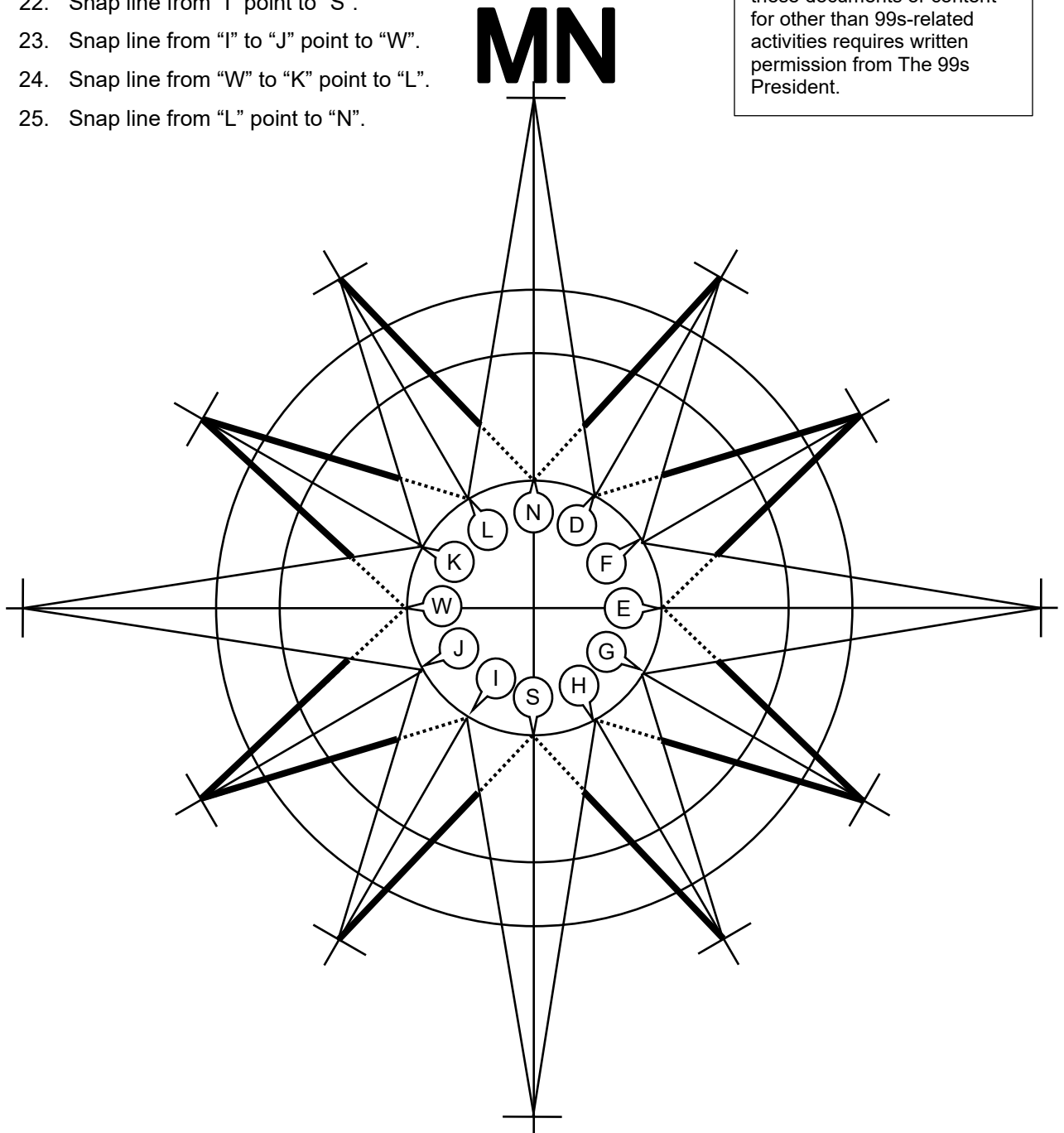
Appendix 2

Layout Details

Mt. Shasta Compass Layout - 4

18. Snap line from "D" point to "N".
19. Snap line from "D" to "F" point to "E".
20. Snap line from "E" to "G" point to "H".
21. Snap line from "H" point to "S".
22. Snap line from "I" point to "S".
23. Snap line from "I" to "J" point to "W".
24. Snap line from "W" to "K" point to "L".
25. Snap line from "L" point to "N".

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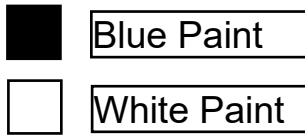


Appendix 2

Layout Details

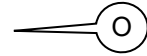
Mt. Shasta Compass Layout - 5

- 26. Layout the interlocking 99s in the center of the rose. See the interlocking 99s layout instructions that follow.
- 27. Write the color in each section before starting to paint. See the shading below for one suggestion of colors.
- 28. Position the "MN" and radial heading numbers as shown.
- 29. Mark the survey month, year and the annual change in variation "O" beside the north arrow. One foot letters are sufficient for this.
- 30. Extend N/E/S/W lines into the center circle as shown by "M" and the next step.

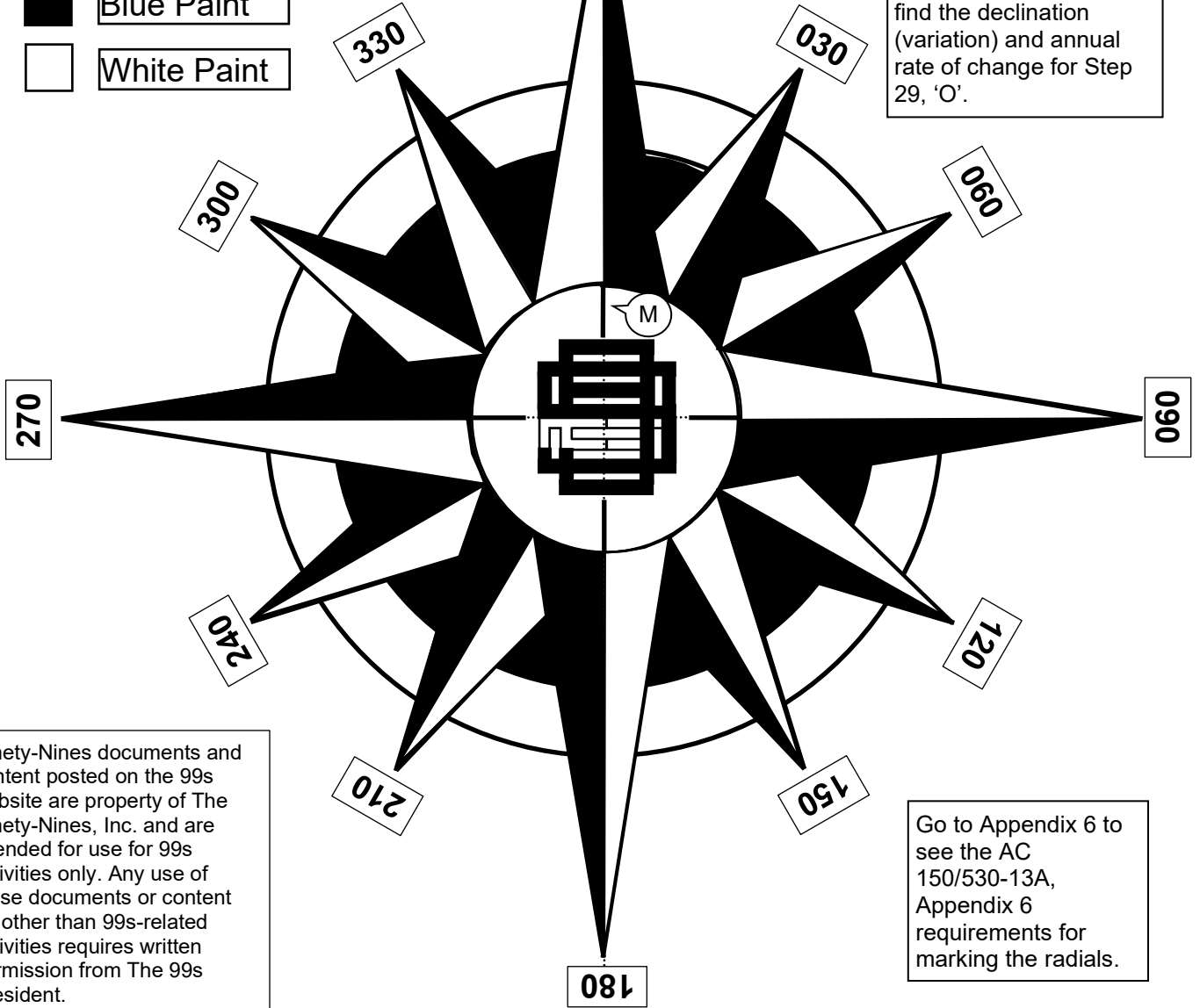


MN

Survey 5/2000
Var inc 0°4' W/year



Go to <http://www.ngdc.noaa.gov/geomag-web/#declination> to find the declination (variation) and annual rate of change for Step 29, 'O'.



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Go to Appendix 6 to see the AC 150/530-13A, Appendix 6 requirements for marking the radials.

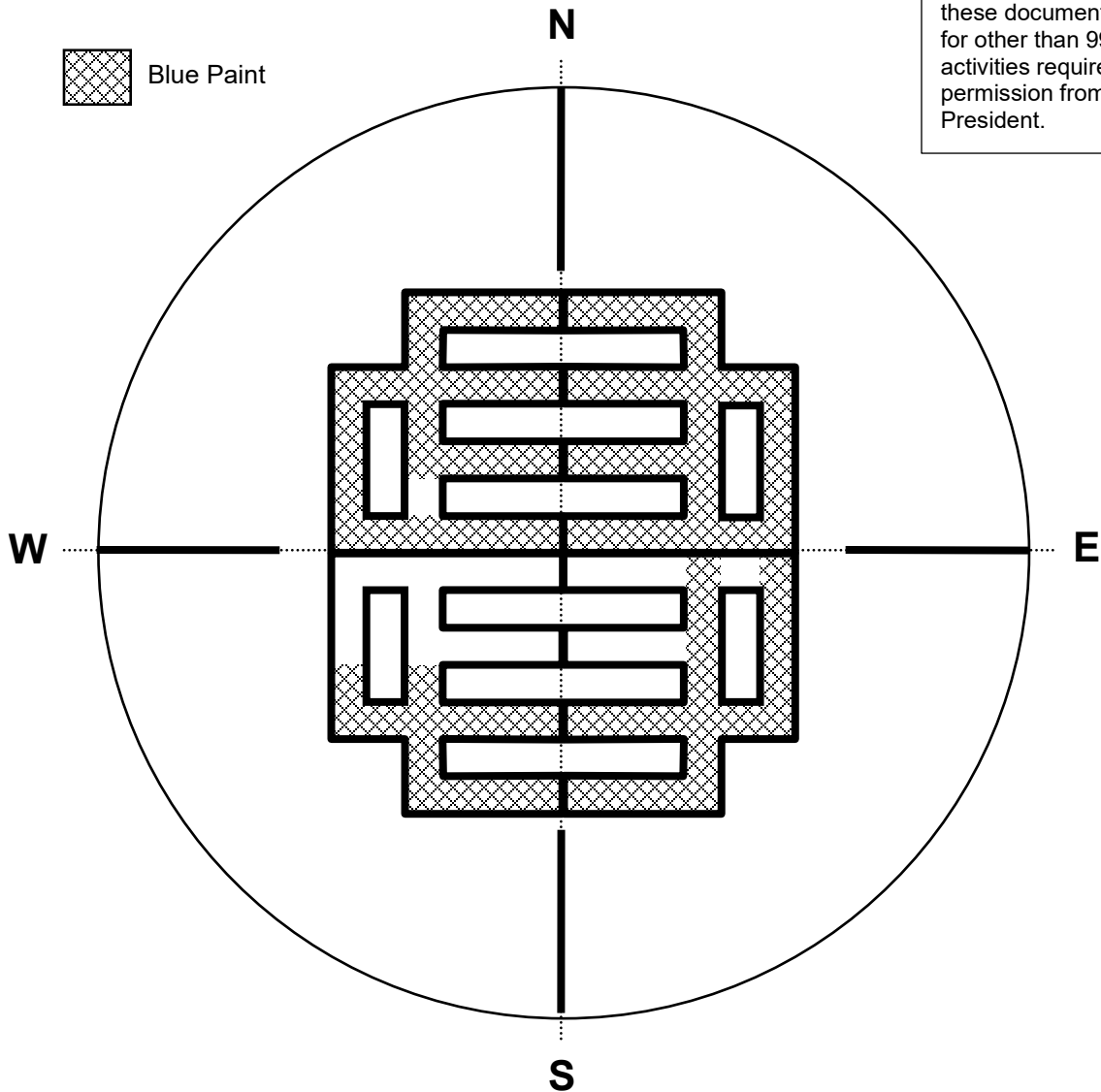
Appendix 2

Layout Details

Mt. Shasta Compass Layout - 6

- 31. To help users line up their airplanes, add 2" wide stripe inside the center circle as shown below. Center on the extended N/S and E/W lines.
- 32. End stripe 4" before the outside edge of the interlocking 99s.

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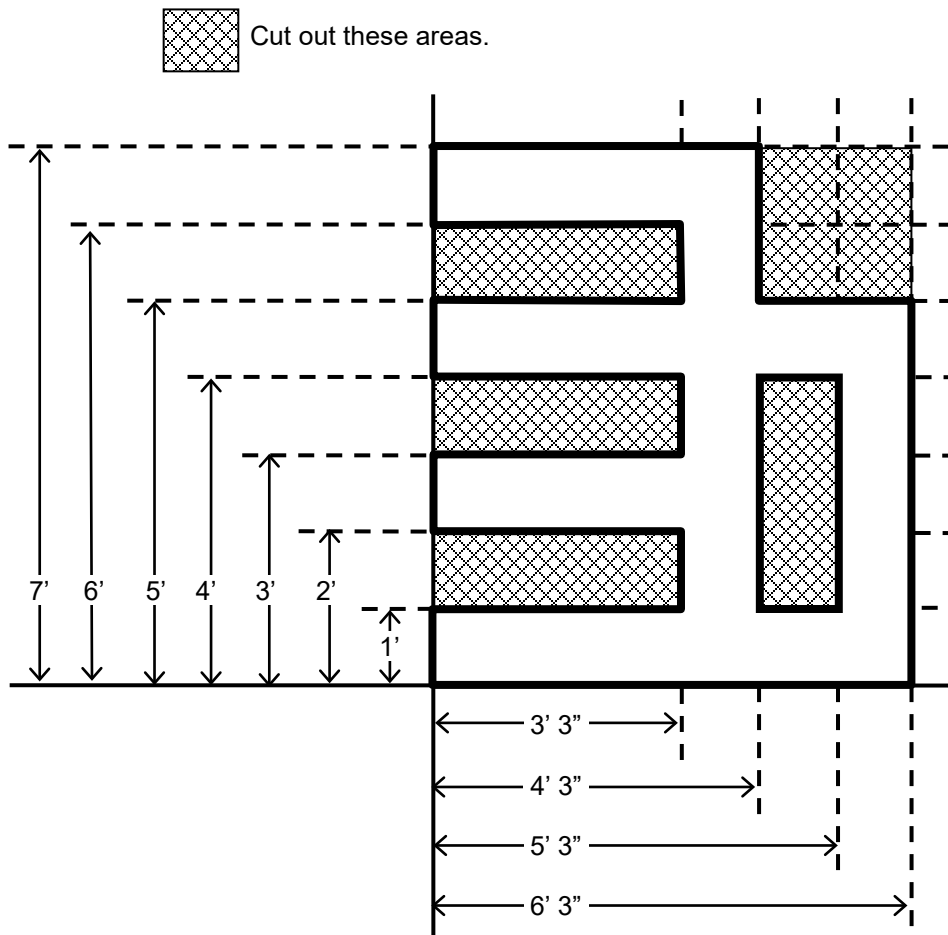


Appendix 2

Layout Details

Interlocking 99s Quarter Template

This template is sized for a 10 foot radius (20 foot diameter) circle which is the center circle of an 80 foot compass rose. Use large pieces of paper, cardboard, foam core board or one foot wide cardboard stripes for the template. Make sure all corners are square. The large home improvement stores have 4' x 8' sheets of foam core board. Use packaging tape to put two pieces of foam core board together.



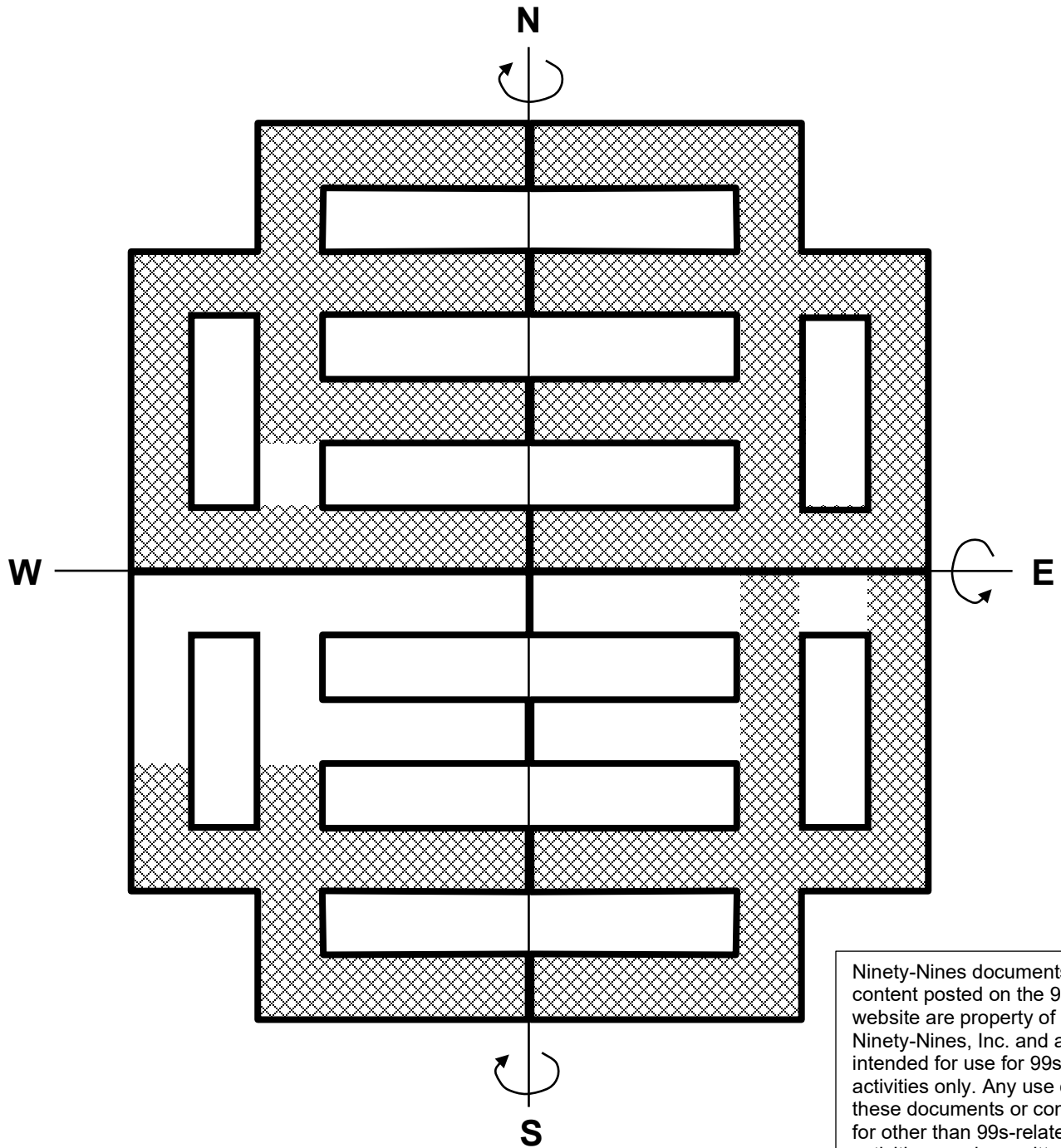
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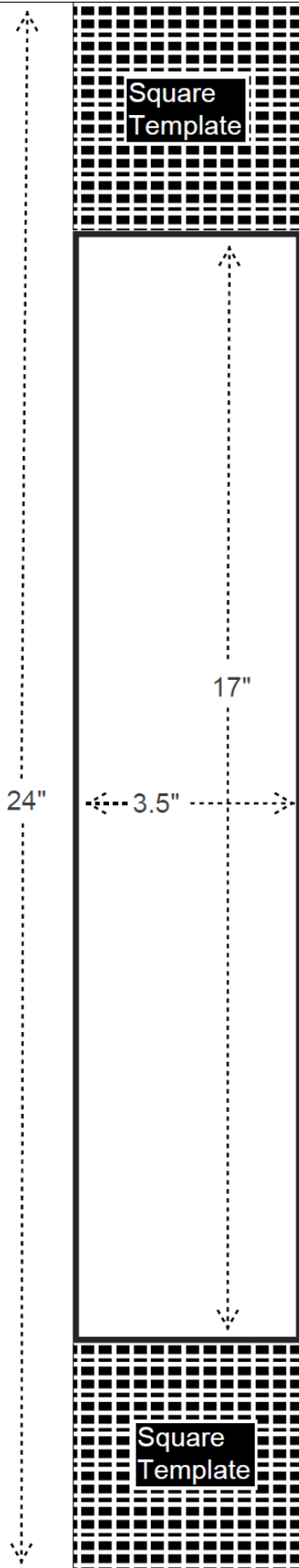
Layout Details

Interlocking 99s Quarter Template Layout

Lay template in the NE quarter of the center circle. Draw around it. Then rotate (flip) to the other three quarters as shown. Fill in between the lines as shown below.



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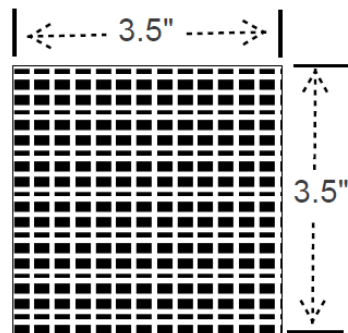
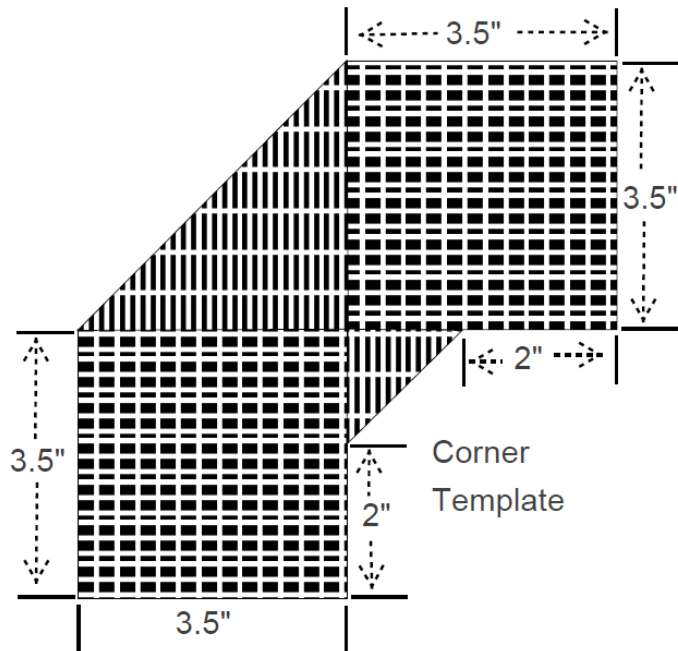


To print for making stencil or template
 Enlarge 250%
 The number "1" is 24" high and 3.5" wide.

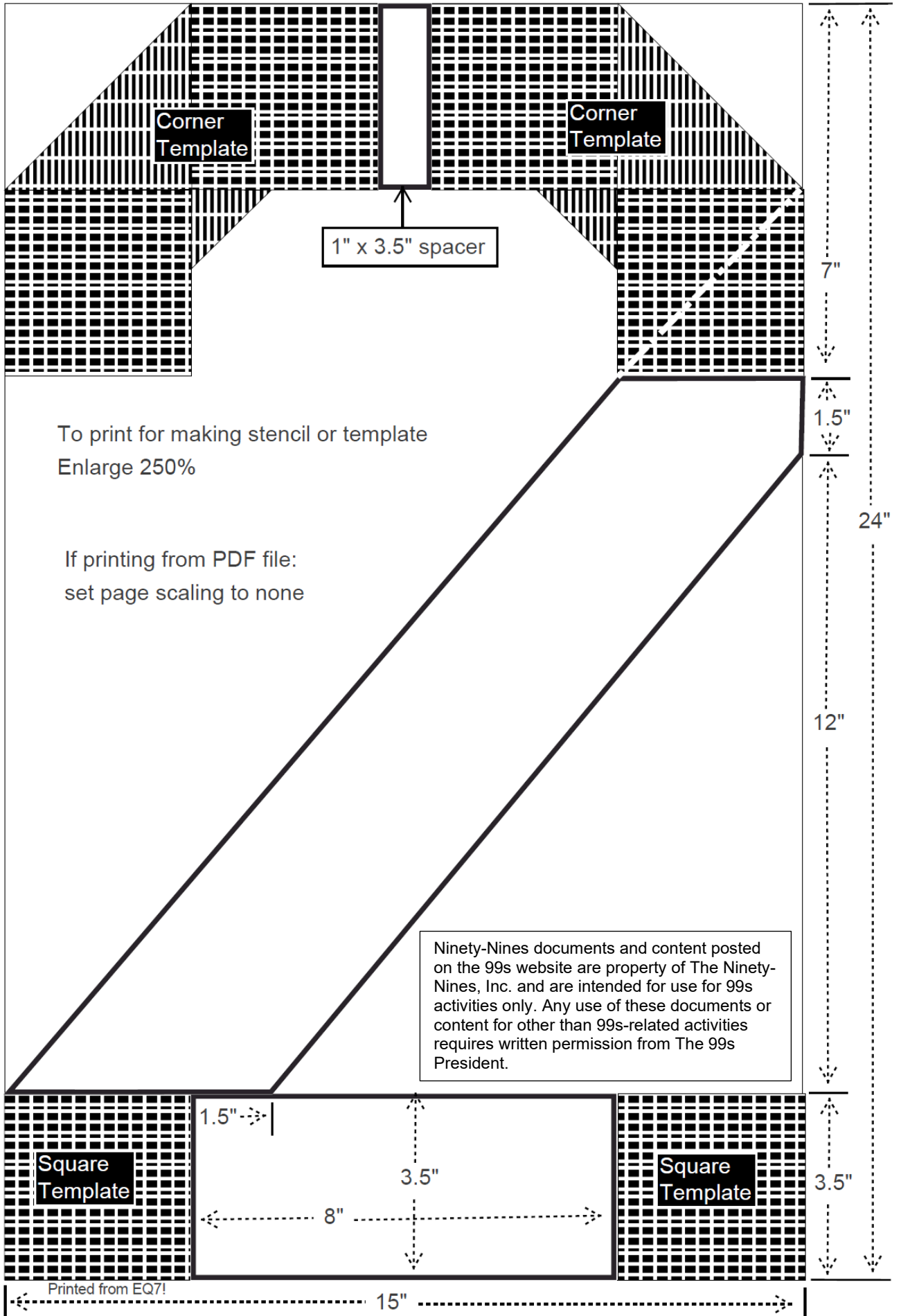
If printing from PDF file:
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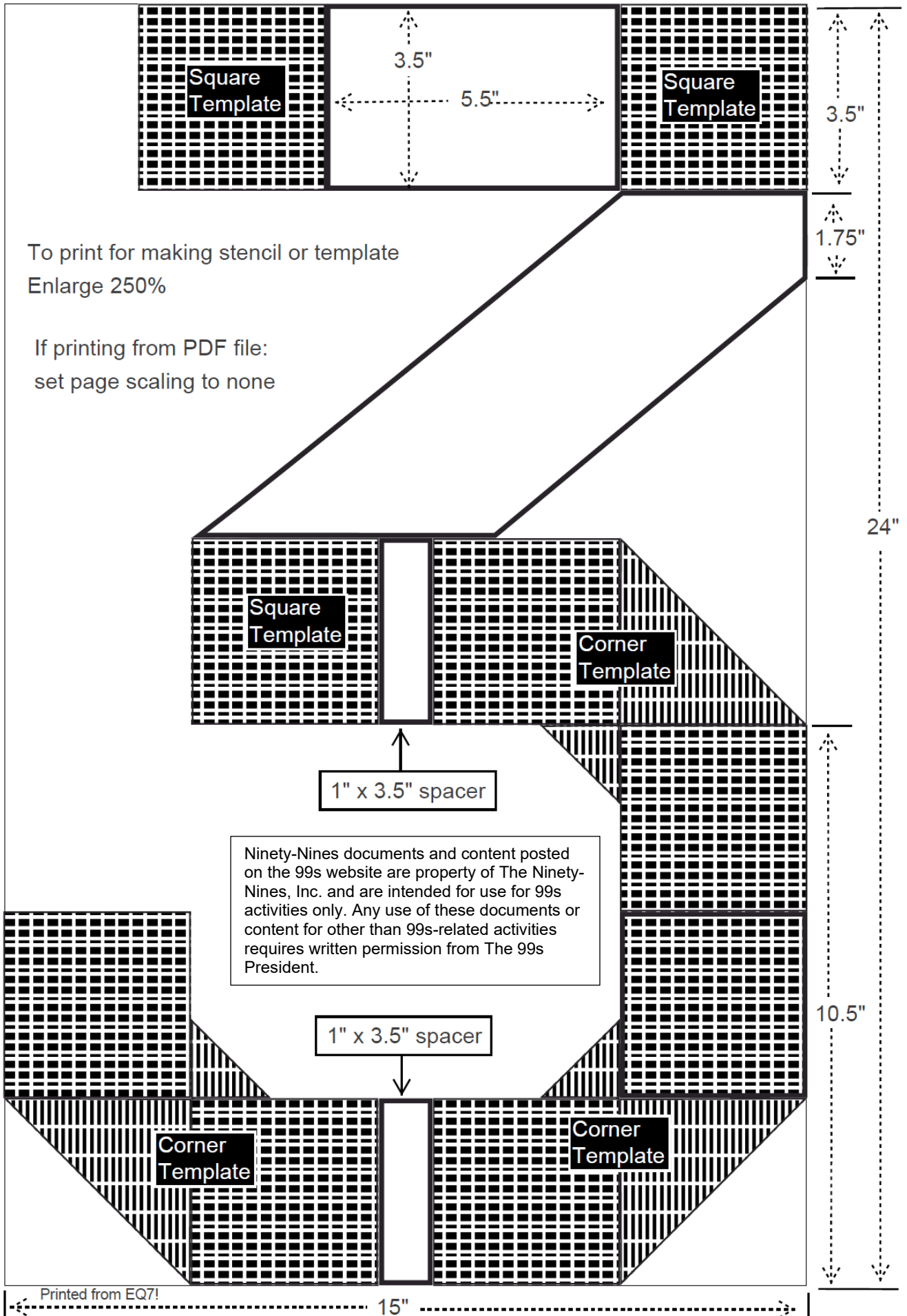
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Shapes below are templates used to lay out all of the numbers and letters.

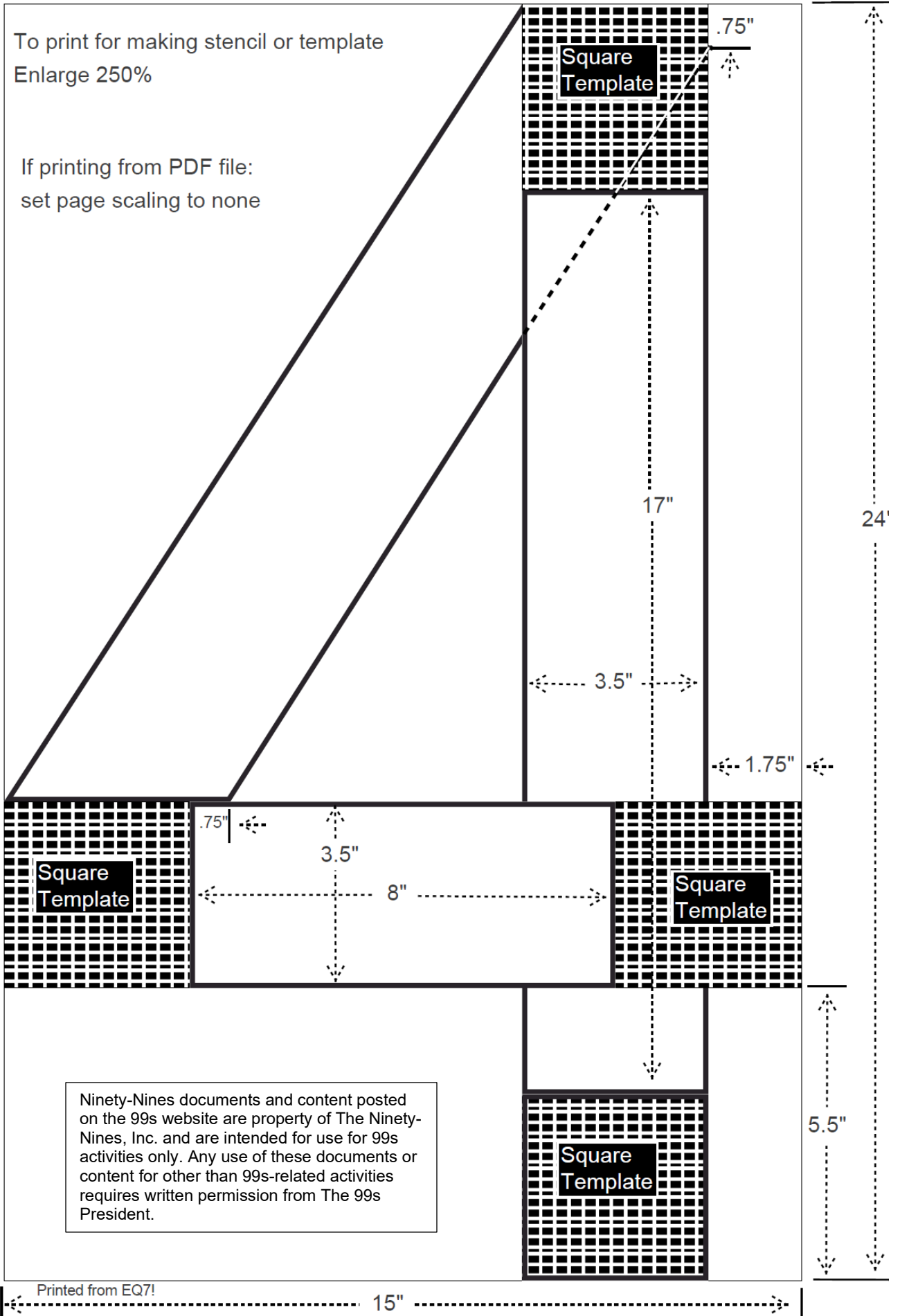


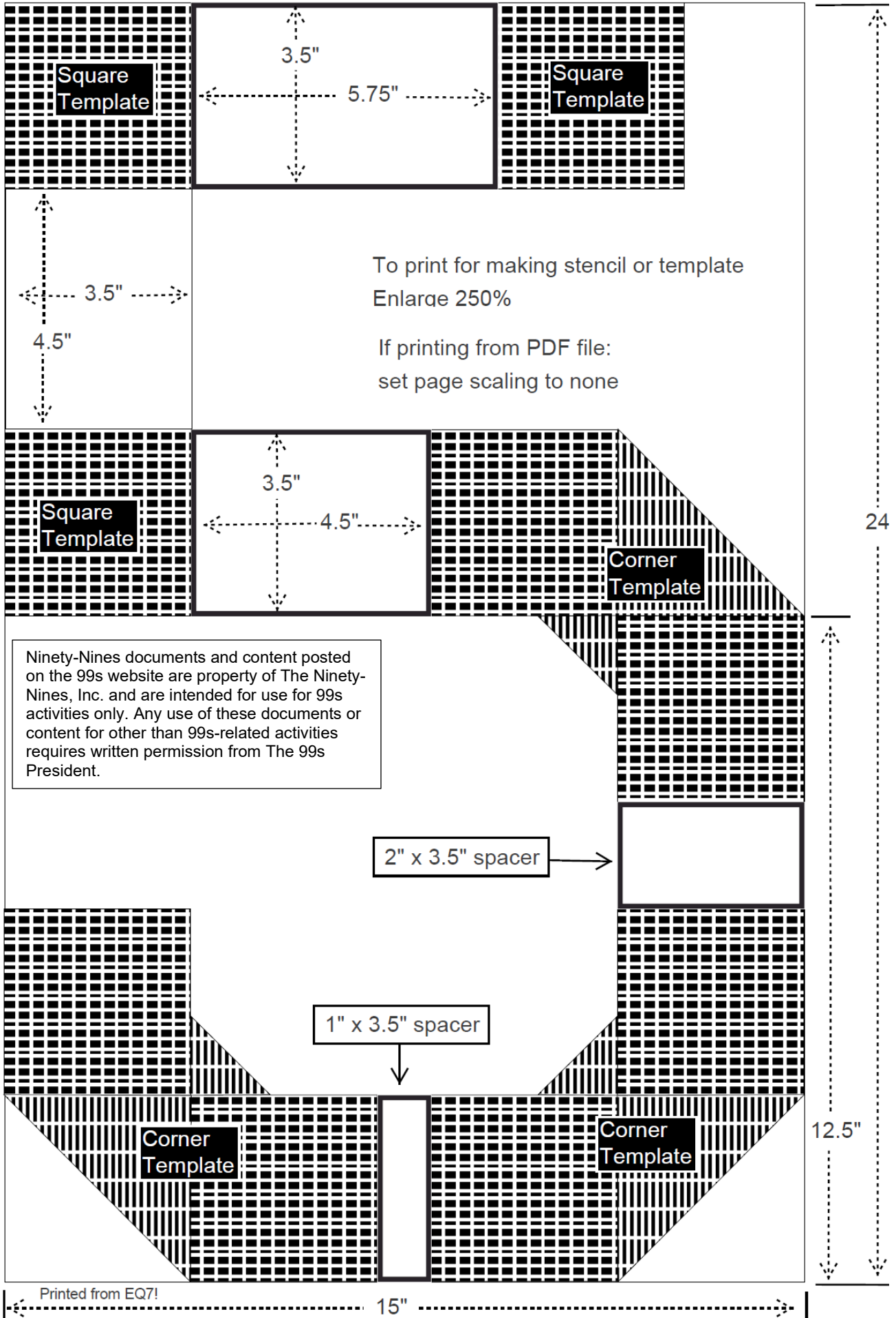
Square Template



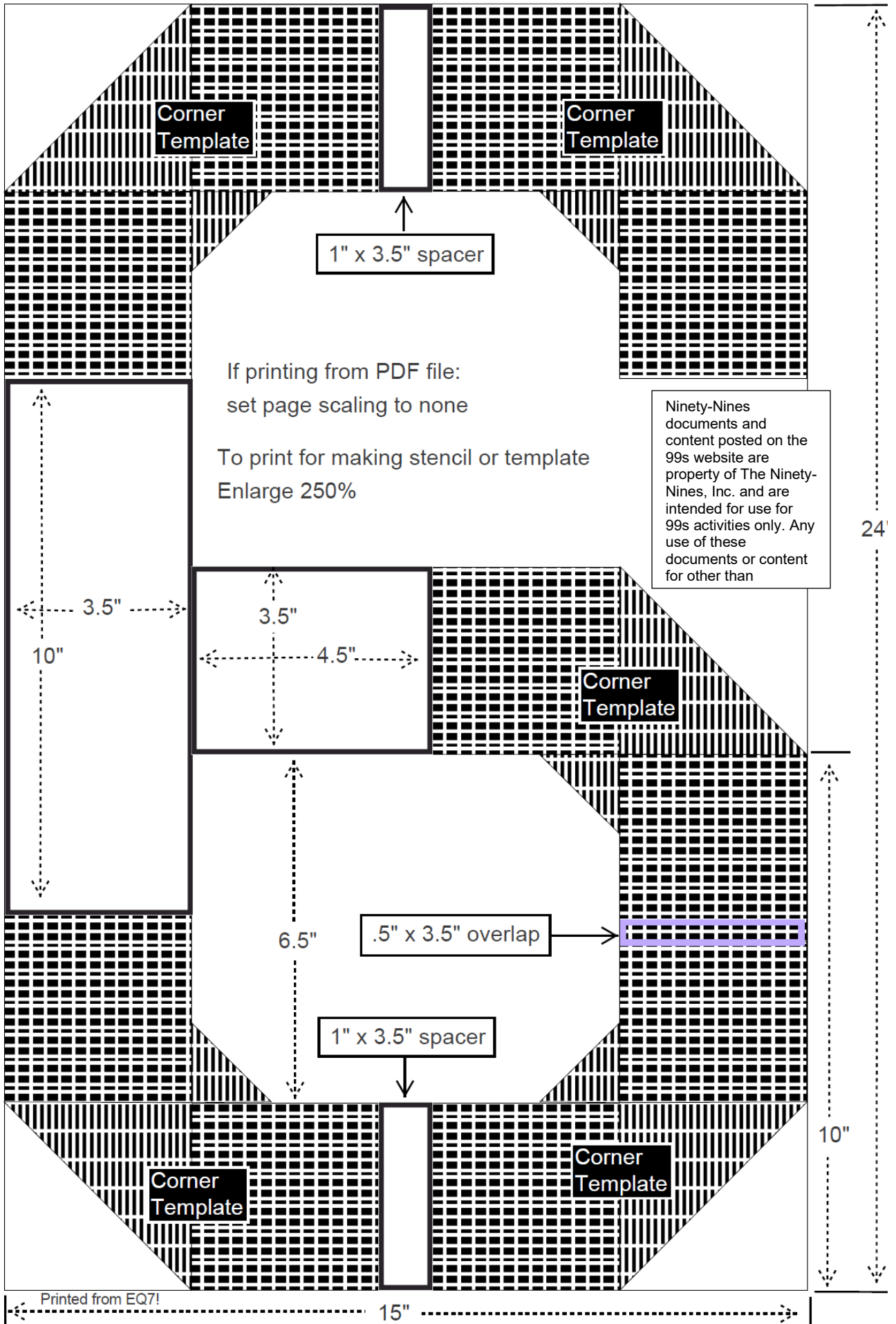


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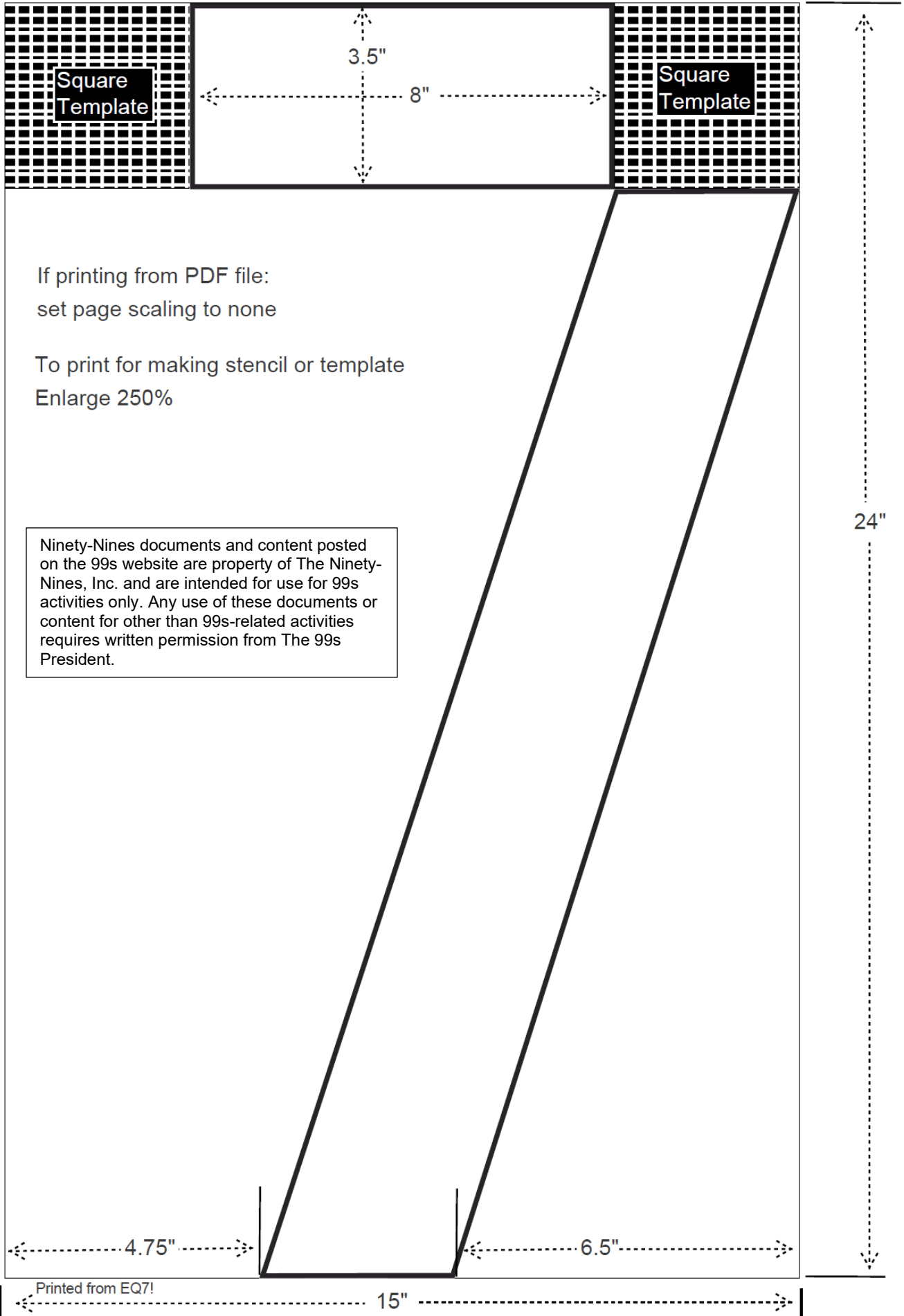


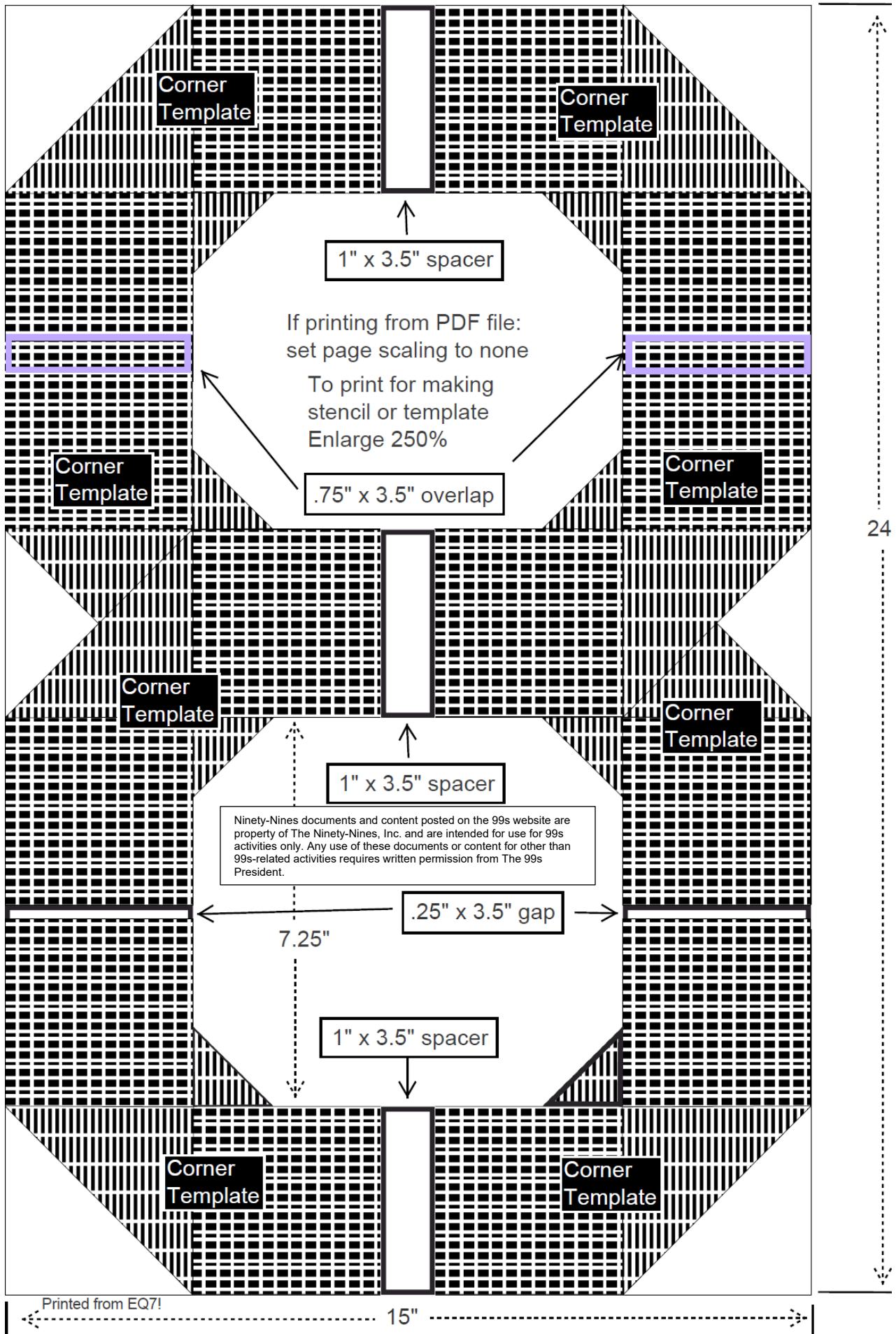


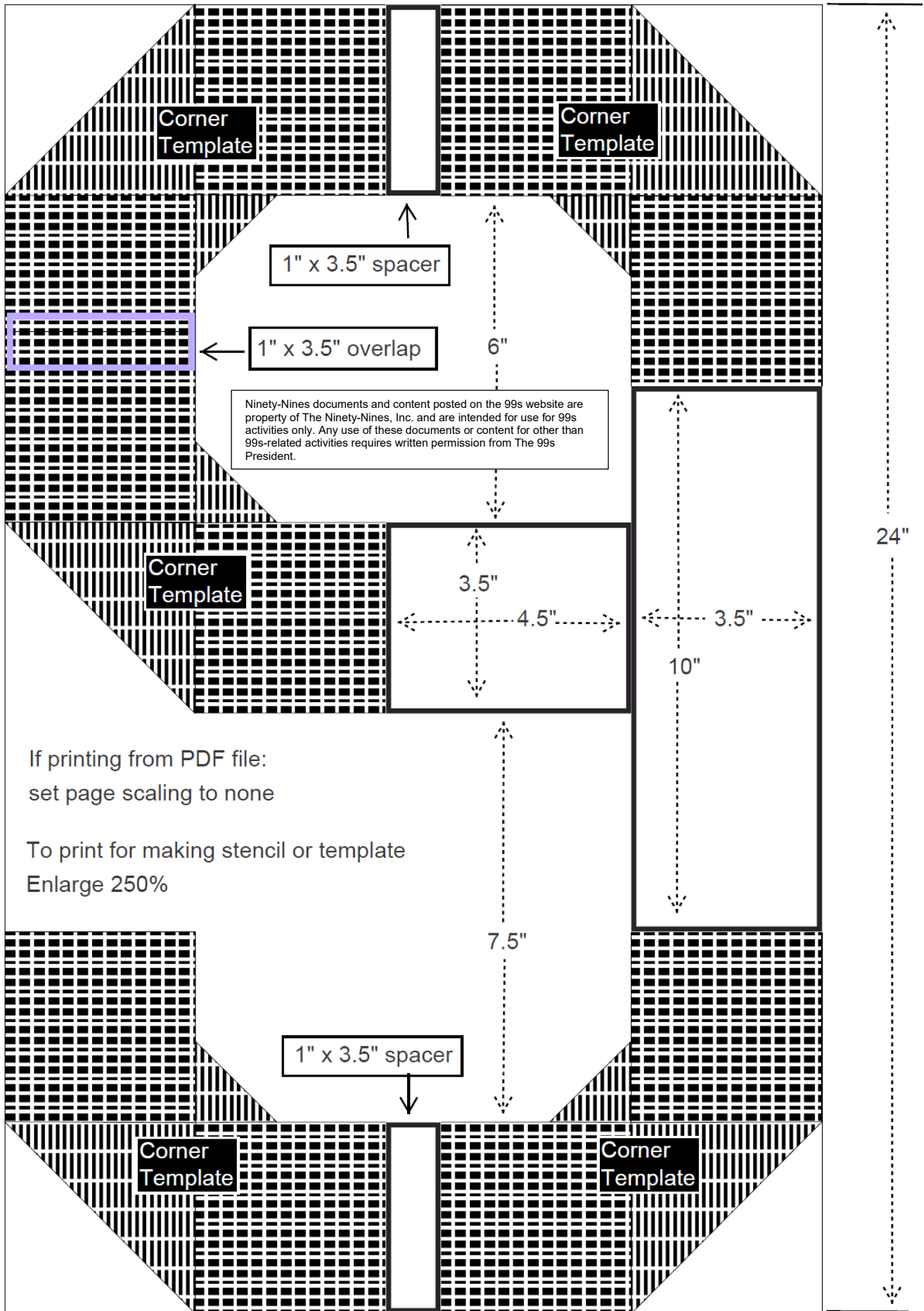
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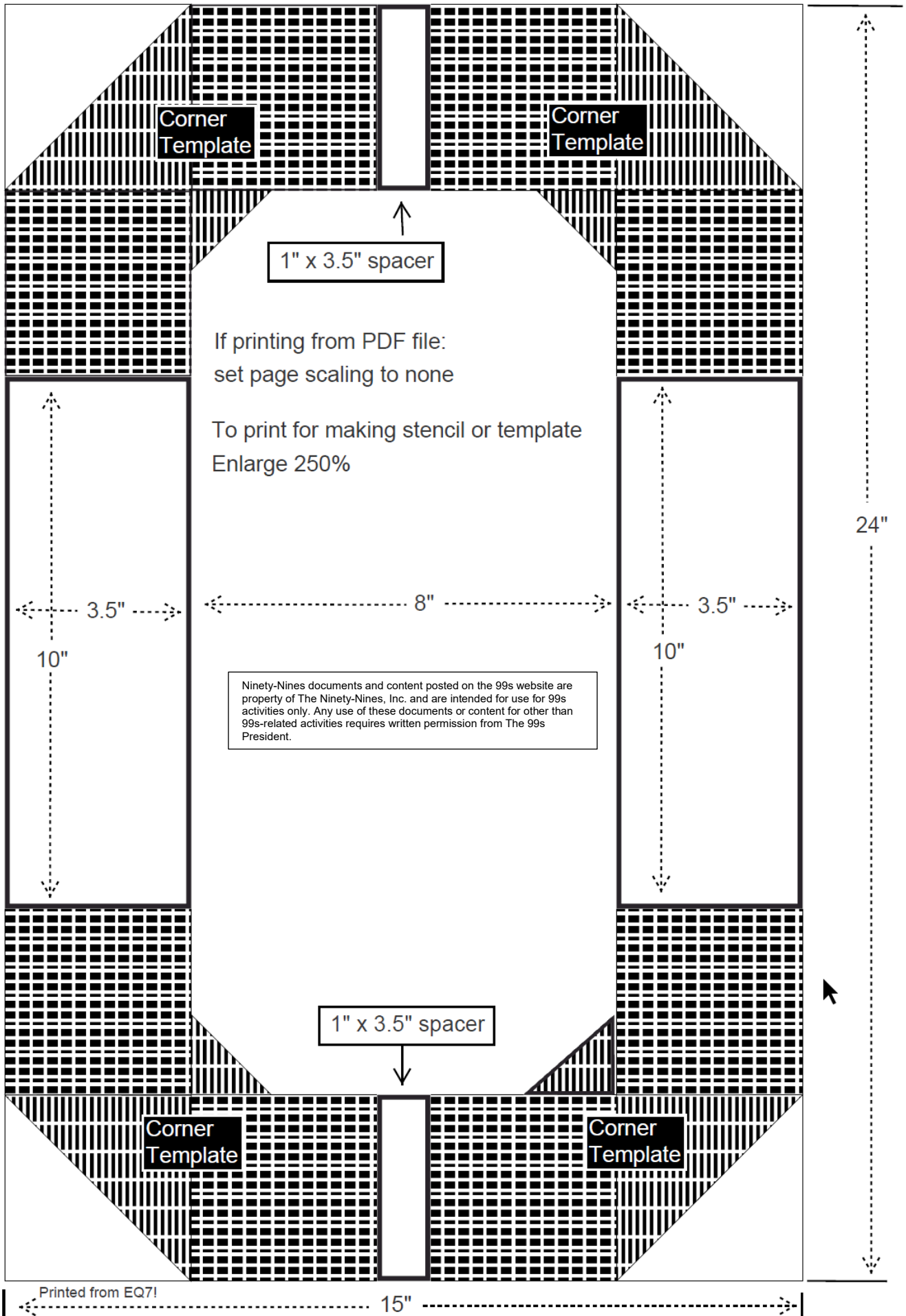


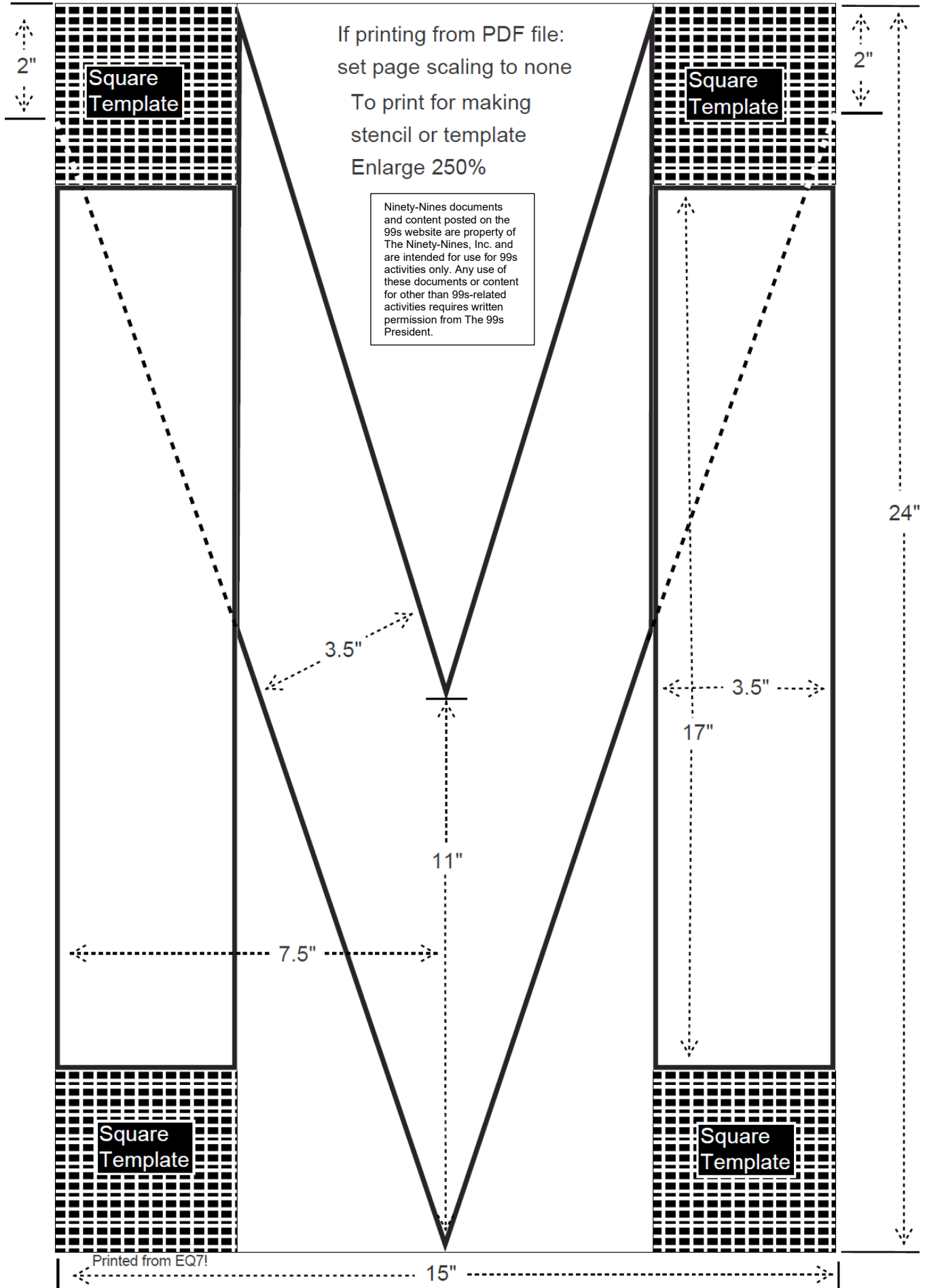


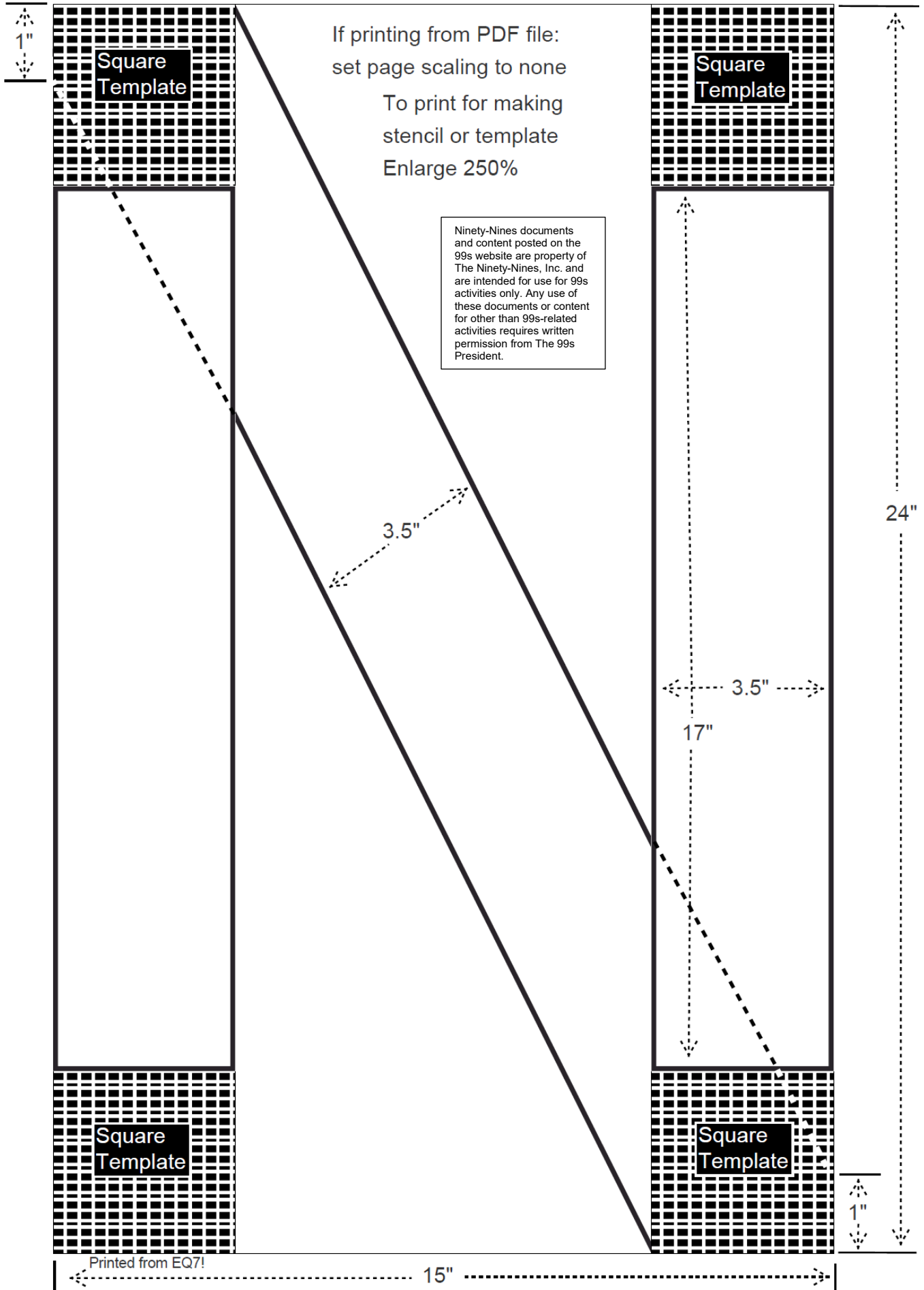


If printing from PDF file:
set page scaling to none

To print for making stencil or template
Enlarge 250%





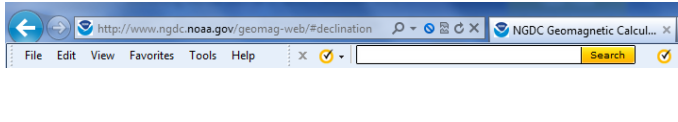

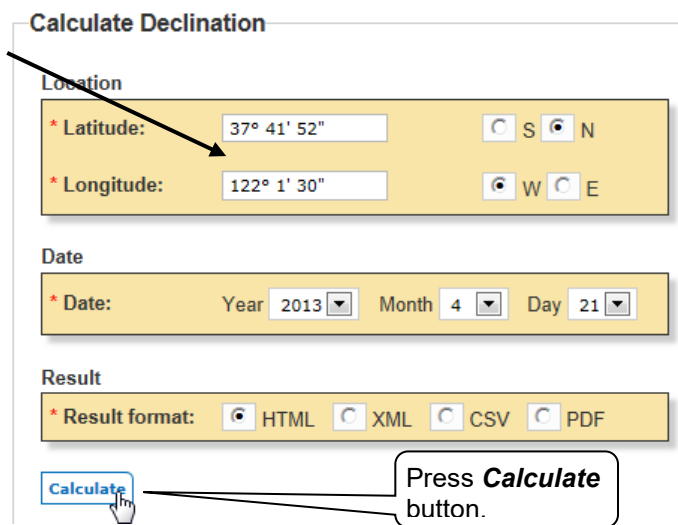


Appendix 3

Getting the Change in Variation (Declination) from NOAA Website

This document will show you how to find the change in variation/declination from the NOAA Geophysical Data Center. This data must be painted beside a compass rose to comply with FAA Advisory Circular 150-5300-13A, Appendix 6, **Compass Calibration Pad**, Paragraph A6-5.c.

You will need to know the Zip Code or Latitude and Longitude and the date of the compass rose survey for the airport you are painting.

<ol style="list-style-type: none">1. Open your web browser.2. Type in the following web address: http://www.ngdc.noaa.gov/geomag-web/#declination	
<ol style="list-style-type: none">3. Press the Enter key.4. If you know the Latitude and Longitude, go to Step 7.	
<ol style="list-style-type: none">5. Type the airport zip code into the Search for a place in the USA by Zip Code box. For this example we are using 945526. Press the Get Location button.	
<ol style="list-style-type: none">7. The Latitude and Longitude for the zip code will appear on the second section of the webpage. If you know the Latitude and Longitude, you can enter them directly.8. Press the Calculate button.	

Appendix 3

Getting the Change in Variation (Declination) from NOAA Website

9. The declination (variation) and annual change is displayed for the chosen zip code.
10. For this example, you will paint the following beside the compass rose:

Survey 4/2013
Var 6.2' W/year

Note: ***Declination = Variation***

The screenshot shows the NOAA Declination website interface. At the top, the title "Declination" is displayed. Below it, the coordinates are listed: Latitude: 37° 41' 52" N and Longitude: 122° 1' 30" W. A table shows the date "2013-04-21" and the declination "13° 54' 36" E changing by 6.2' W per year". Below the table is a map of Castro Valley, CA, with a compass rose overlaid. The compass rose has a red needle pointing towards the top, and the letters "MN" are written in red above it. A callout box points to the declination value in the table, stating "The annual change is variation is displayed here." The map includes street names like "Castro Valley", "Fairview", and "Hayward Blvd".

Date	Declination
2013-04-21	13° 54' 36" E changing by 6.2' W per year

Appendix 4

Paint Information

Several years ago, I had the chance to get some professional painting advice and wanted to pass on this information.

Any questions about putting a black sealer under the compass rose should be directed to the paint manufacturer customer service folks. I will comment that the folks at KILG put a sealer on a compass rose pad before the Delaware Chapter painted. The rose did last however, while painting with oil-based paint; we found that after the brush/roller went over the sealer once, we started to pull the black color through the white paint. It might be better to not put a sealer on before the paint. The sealer had been applied the day before and did not have a chance to cure as discussed below.

Additionally, about the paint - I talked with a Sherwin-William product specialist in 2012.

<http://www.sherwin-williams.com>

I have included the data sheet for one of their paints that have been approved by the FAA for runway markings. The Setfast(TM) paint spec sheet indicates that a roller or brush can be used for small area application. The second Sherwin-Williams paint approved for airports, Hotline(TM), dries about a 1/2 hour faster than the Setfast(TM); however, they only recommend spray application. I do not know what other manufacturers have.

I did hear a recommendation from out west about putting anti-graffiti sealer on top of a compass rose to help it last. Then I heard this was not good, because tires will pick up the paint. This was confirmed Sherwin-Williams rep that I talked with. Apparently, the anti-graffiti sealers are designed for vertical surfaces and not horizontal ones. "Hot tire pick-up" is a real issue if used on a horizontal surface.

She also recommended that you need to wait for the ramp surface, if new, to be fully cured before it is painted. She recommended 90 days for asphalt and 30 days for concrete. If there is bleed through, it is because the surface is not fully cured. Based on our experience at KILG, I am sure that this would also apply to any sealer put on asphalt.

A recent tip passed on to me that can be a cost saver for the airport/FBO that will supply the paint. Highway/road marking paints have an expiration date. If the airport or the local government road department have paint that is near expiration date or has expired, instead of throwing out, use that paint for an airmarking project.

Ellen Nobles-Harris
International Airmarking Chairman
The Ninety-Nines, Inc.

March 19, 2012



Traffic & Zone Products

SETFAST® LOW VOC ACRYLIC TRAFFIC MARKING PAINT

TM5626
TM5627

WHITE
LEAD FREE YELLOW

Revised 9/09

PRODUCT INFORMATION

10.11

PRODUCT DESCRIPTION

SETFAST LOW VOC ACRYLIC TRAFFIC MARKING PAINT is a conventional dry (non-heat applied) acetone based paint. Acetone, as the main solvent, has Exempt Status under Federal law and does not contribute harmful VOC's.

This is 100% acrylic, which offers the following outstanding properties:

- Faster dry and hardness development.
- Performance similar to SetFast Chlorinated Rubber Traffic Paint
- Dirt resistant

PRODUCT CHARACTERISTICS

Finish:	Flat
Color:	White, LF Yellow
Volume Solids:	47%, minimum
Weight Solids:	70%, minimum
VOC (EPA Method 24):	<100 g/L; <0.83 lb/gal

Recommended Spreading Rate per coat:

Approximately 320 lineal feet of standard 4" stripe per gallon

	Minimum	Maximum
Wet mils (microns)	15.0	375
Dry mils (microns)	7.5	188
~Coverage sq ft/gal (m ² /L)	110	2.7
Theoretical coverage sq ft/gal (m ² /L) @ 1 mil / 25 microns dft	752	18.4

NOTE: Brush or roll application for small areas only.

If the asphalt is insufficiently cured, applying a thin coat (approximately 1/2 the recommended dft) generally reduces the extent of lifting and cracking.

Drying Schedule @ 15.0 mils wet (375 microns):

@ 77°F/25°C
50% RH

To touch: 5 minutes

No traffic pickup after: 5 minutes

Drying time is temperature, humidity, and film thickness dependent.

Shelf Life:	12 months, unopened Store indoors at 40°F (4.5°C) to 100°F (38°C)
Flash Point:	1°F (-17°C), PMCC
Reducer:	Not recommended
Clean Up:	Acetone, R6K9

RECOMMENDED USES

Developed for use over concrete, asphalt, brick, and other surfaced areas. Serves as a binder for glass beads to make reflective type markings. Do not use this coating over uncured asphalt surfaces such as commonly found on tennis courts, asphalt driveways, and some parking lots.

- Striping contractors
- Shopping centers
- Plant maintenance
- Curbs
- Municipalities
- Parking lots
- Airport runways

PERFORMANCE CHARACTERISTICS

- Abrasion resistant
- Bleed resistant
- High visibility
- Glass beads can be added to make reflective markings
- High hiding
- Fast drying

Federal EPA has added acetone to the list of solvents exempt from the VOC definition. State or local laws may incorporate the federal definitions, or may use their own, and may take precedence over the federal rules. Acetone may or may not be an exempt solvent where state or local regulations are in effect. Consult with your local Sherwin-Williams representative for additional information.



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PRODUCT INFORMATION

10.11

RECOMMENDED SYSTEMS

Cured Asphalt, Concrete, and Brick:

1 ct. SetFast Low VOC Acrylic Traffic Marking Paint @ 15.0 mils (375 microns) wet and 7.5 mils (188 microns) dft, approximately 320 lineal feet of standard 4" stripe per gallon

The systems listed above are representative of the product's use, other systems may be appropriate.

SURFACE PREPARATION

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Refer to product Application Bulletin for detailed surface preparation information.

Minimum recommended surface preparation:

Concrete: Cured, clean, dry, sound
Asphalt: Cured, clean, dry, sound
Brick: Cured, clean, dry, sound

Surface Preparation Standards

Condition of Surface	ISO 8501-1 BS7079:A1	Swedish Std. SIS055900	SSPC	NACE
White Metal	Sa 3	Sa 3	SP 5	1
Near White Metal	Sa 2.5	Sa 2.5	SP 10	2
Commercial Blast	Sa 2	Sa 2	SP 6	3
Brush-Off Blast	Sa 1	Sa 1	SP 7	4
Hand Tool Cleaning	Rusted Pitted & Rusted	C St 2 D St 2	SP 2	-
Power Tool Cleaning	Rusted Pitted & Rusted	C St 3 D St 3	SP 3	-

TINTING

May be tinted with up to 4 oz/gal of Blend-A-Color or Maxitoner Colorant. Only exterior grade colorants should be used. Handicap Blue may be obtained by tinting white with 2-3 oz of blue colorant per gallon. Not controlled for tinting strength.

APPLICATION CONDITIONS

Temperature: 40°F (4.5°C) minimum, 90°F (32°C) maximum (air, surface, and material)
At least 5°F (2.8°C) above dew point
Relative humidity: 85% maximum

Refer to product Application Bulletin for detailed application information.

ORDERING INFORMATION

Packaging: 5 gallon (18.9L) containers

Weight:
White: 11.64 ± 0.2 lbs/gal ; 1.40 Kg/L
Lead-free Yellow: 11.48 ± 0.2 lbs/gal ; 1.37 Kg/L

SAFETY PRECAUTIONS

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

WARRANTY

The Sherwin-Williams Company warrants our products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product or the refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY SHERWIN-WILLIAMS, EXPRESSED OR IMPLIED, STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

DISCLAIMER

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www.sherwin-williams.com/protective



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PRODUCT INFORMATION

10.11

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The systems listed above are representative of the product's use, other systems may be appropriate.

SURFACE PREPARATION

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Refer to product Application Bulletin for detailed surface preparation information.

Minimum recommended surface preparation:

- Concrete: Cured, clean, dry, sound
- Asphalt: Cured, clean, dry, sound
- Brick: Cured, clean, dry, sound

Surface Preparation Standards

Condition of Surface	ISO 8501-1 BS7079:A1	Swedish Std. SIS055900	SSPC	NACE
White Metal	Sa 3	Sa 3	SP 5	1
Near White Metal	Sa 2.5	Sa 2.5	SP 10	2
Commercial Blast	Sa 2	Sa 2	SP 6	3
Brush-Off Blast	Sa 1	Sa 1	SP 7	4
Hand Tool Cleaning	Rusted C St 2	C St 2	SP 2	-
Pitted & Rusted	D St 2	D St 2	SP 2	-
Rusted	C St 3	C St 3	SP 3	-
Power Tool Cleaning	Pitted & Rusted D St 3	D St 3	SP 3	-

TINTING

May be tinted with up to 4 oz/gal of Blend-A-Color or Maxitoner Colorant. Only exterior grade colorants should be used. Handicap Blue may be obtained by tinting white with 2-3 oz of blue colorant per gallon. Not controlled for tinting strength.

APPLICATION CONDITIONS

- Temperature: 40°F (4.5°C) minimum, 90°F (32°C) maximum (air, surface, and material)
- Relative humidity: At least 5°F (2.8°C) above dew point, 85% maximum

Refer to product Application Bulletin for detailed application information.

ORDERING INFORMATION

Packaging: 5 gallon (18.9L) containers

- Weight:
 - White: 11.64 ± 0.2 lbs/gal ; 1.40 Kg/L
 - Lead-free Yellow: 11.48 ± 0.2 lbs/gal ; 1.37 Kg/L

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WHITE
LEAD FREE YELLOW

APPLICATION BULLETIN

10.11

APPLICATION PROCEDURES

Surface preparation must be completed as indicated.

Mixing Instructions: Mix paint thoroughly to a uniform consistency with low speed power agitation prior to use.

Apply paint at the recommended film thickness and spreading rate as indicated below:

Recommended Spreading Rate per coat:

Approximately 320 lineal feet of standard 4" stripe per gallon

	Minimum	Maximum
Wet mils (microns)	15.0	375
Dry mils (microns)	7.5	188
~Coverage sq ft/gal (m ² /L)	110	2.7
Theoretical coverage sq ft/gal (m ² /L) @ 1 mil / 25 microns dft	752	18.4

NOTE: Brush or roll application for small areas only.

If the asphalt is insufficiently cured, applying a thin coat (approximately 1/2 the recommended dft) generally reduces the extent of lifting and cracking.

Drying Schedule @ 15.0 mils wet (375 microns):

@ 77°F/25°C
50% RH

To touch: 5 minutes

No traffic pickup after: 5 minutes

Drying time is temperature, humidity, and film thickness dependent.

Application of coating above maximum or below minimum recommended spreading rate may adversely affect coating performance.

CLEAN UP INSTRUCTIONS

Clean spills and spatters immediately with Acetone, R6K9. Clean tools immediately after use with Acetone, R6K9. Follow manufacturer's safety recommendations when using any solvent.

DISCLAIMER

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PERFORMANCE TIPS

Spreading rates are calculated on volume solids and do not include an application loss factor due to surface profile, roughness or porosity of the surface, skill and technique of the applicator, method of application, various surface irregularities, material lost during mixing, spillage, overthinning, climatic conditions, and excessive film build.

No reduction of material is recommended as it can affect film build, appearance, and adhesion.

In order to avoid blockage of spray equipment, clean equipment before use or before periods of extended downtime with Acetone, R6K9.

Asphalt surfaces generally require aging prior to painting.

If the asphalt is insufficiently cured, applying a thin coat (approximately 1/2 the recommended dft) generally reduces the extent of lifting and cracking.

Check adhesion by applying a test strip to determine the readiness for painting.

The coating may be made into reflective paint by dropping on glass beads while the paint is still wet.

Painted surfaces can become slippery when wet. Zone Marking paints are not intended for use as floor paints, and should not be used to paint large areas subject to pedestrian traffic. For instance, painting an entire traffic stall is not recommended.

Do not paint on wet surfaces.

Do not paint when the relative humidity is above 85%.

Do not paint when the temperature is below 40°F (4.5°C).

Cool, damp conditions will prolong the drying time.

Refer to Product Information sheet for additional performance characteristics and properties.

SAFETY PRECAUTIONS

Refer to the MSDS sheet before use.

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Appendix 5

Compass Calibration Pads

Advisory Circular 150/5300-13A Appendix 6

The AC appendix that follows is from AC 150/5300-13A was issued 9/28/2012. It canceled 150/5300-13 which we had been using for guidance for our compass roses. The design details in this appendix are for guidance only. The 99s compass rose “variation” is acceptable provided we meet the general requirements.

There are some differences between the new AC 150/5300-13A, Appendix 6 (AC13A-A6) and the old AC 150/5300-13, Appendix 4 (AC13-A4) and what we do in this manual which I will discuss below. The actual AC 150/5300-13A, Appendix 6 follows this page.

1. AC13A-A6 has more definition about marking each of the radials, including size and stroke width. This is shown in the Mt. Shasta Compass Rose Layout – 5 on page 44. Templates for these, which will have to be enlarged by your local office supply house or printer, are included in Appendix 2.
2. AC13A-A6 Figure A6-1 shows using two arrows to indicate true north and the variation for magnetic north. The AC also indicates that the date of survey and rate of change in variation should be shown. For our purposes, we should use the date of survey and rate of change. Lettering one foot high should be sufficient for this since normally there will be a person on the ground working with the pilot when swinging a compass.
3. AC13A-A6 indicates that there should be radials every 30 degrees in the compass rose, so we should not change that.
4. There is substantially more detail in AC13A-A6 about the survey, how it is done and making sure that the variation/declination is even across the compass rose pad and for a distance beyond. This is one of the reasons the airport/FBO should be responsible for having the survey done. You should also ask for a copy of the surveyor’s report for your records.
I received a report of 2012 survey pricing for a central Pennsylvania location.
The actual cost invoiced by the surveyor was \$4,071.
Their scope of work included three sequential elements:
Step 1 – initial magnetic survey to determine if the site was adversely affected by natural or man-made magnetic anomalies.
Step 2 – Survey to determine if the difference in magnetic variation is uniform in the vicinity of the site.
Step 3 – Stake out of a twelve point compass rose.
5. The U.S. Geological Survey will only provide information about the necessary surveys and equipment, and they will calibrate equipment (for a cost) instead of actually doing the survey.

Appendix 6. Compass Calibration Pad

A6-1. Purpose.

This appendix provides guidelines for the design, location and construction of a compass calibration pad and basic information concerning its use in determining the deviation error in an aircraft magnetic compass.

A6-2. Background.

a. An aircraft magnetic compass is a navigation instrument with certain inherent errors resulting from the nature of its construction. All types of magnetic compasses indicate direction with respect to the earth's magnetic field. This is true even for the gyro-stabilized and/or fluxgate compasses. Aircraft navigation is based on applying the appropriate angular corrections to the magnetic reading in order to obtain the true heading.

b. The aircraft magnetic compass should be checked following pertinent aircraft modifications and on a frequent, routine schedule. One method of calibrating the compass is to use a compass calibration pad to align the aircraft on known magnetic headings and make adjustments to the compass and/or placard markings to indicate the required corrections.

A6-3. Design of compass calibration pad.

The design details in this appendix are provided for guidance only. Variations of these designs are acceptable provided the general requirements are met.

a. The compass calibration pad markings consist of a series of 12 radials painted on the pavement with non-metallic paint. The radials extend toward the determined magnetic headings every 30 degrees beginning with magnetic north (MN). Except for magnetic north, which is marked with "MN," each radial should be marked with its magnetic heading at the end of the radial indicating the direction along which each line lies; e.g., "MN" for magnetic north; "030" for 30 degrees, etc. Each heading, except for magnetic north, will consist of three numerals, 24-inches (610 mm) high by 15-inches (381 mm) wide block numerals with a minimum 3.5-inch (89 mm) wide stroke. The markings must be large enough to be easily read from the aircraft cockpit as the radial is being approached. Figure A6-1 shows a layout of the calibration pad markings.

b. Figure A6-2 depicts a typical calibration pad. It can be constructed of either concrete or asphalt pavement. The pavement thickness must be adequate to support the user aircraft and should be designed in accordance with AC 150/5320-6. For concrete pavements, joint type and spacing should conform to standard practices, with no magnetic (iron, steel or ferrous) materials used in its construction. Therefore, dowels (where required) and any other metallic materials must be aluminum, brass, bronze, or fiberglass, rather than steel.

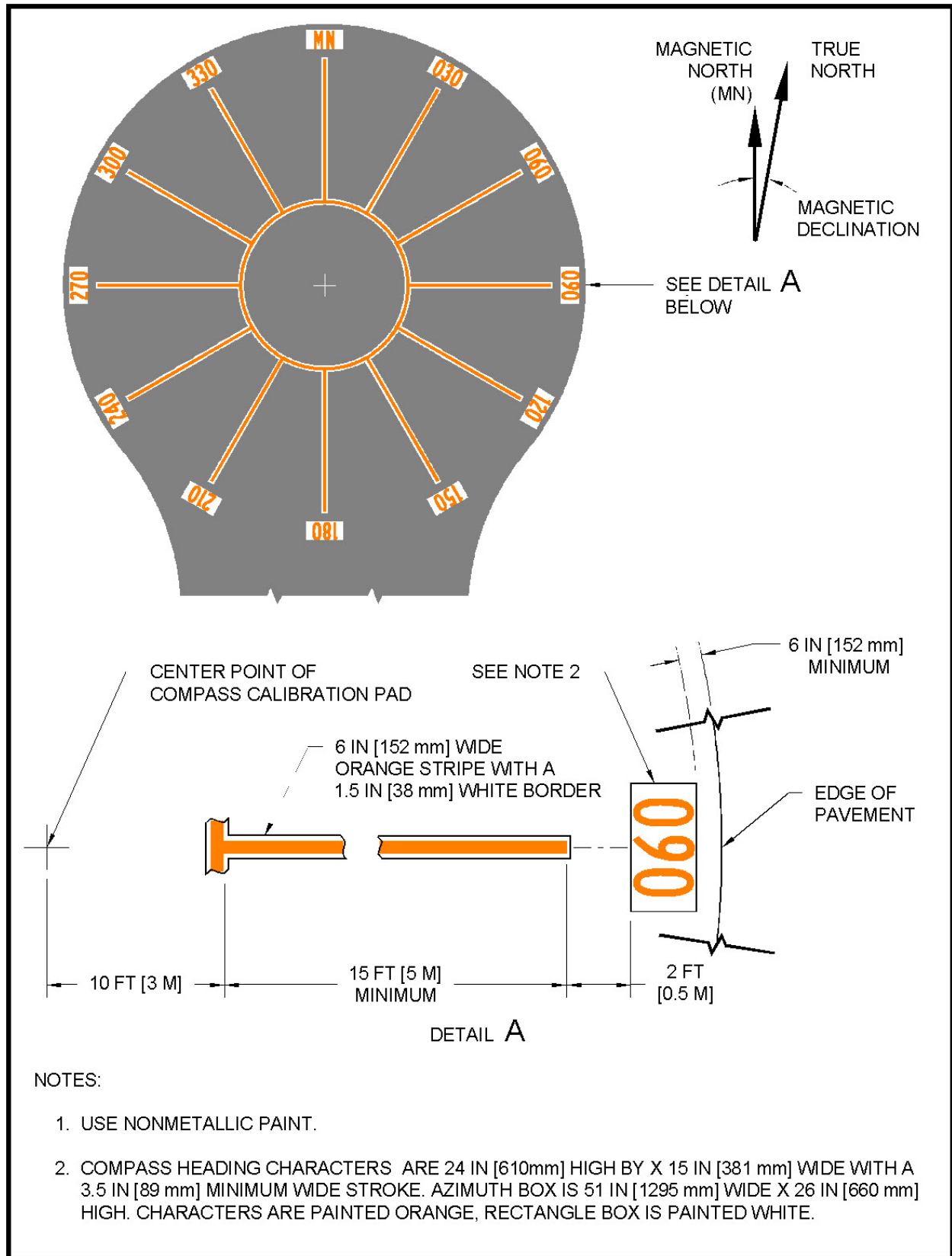
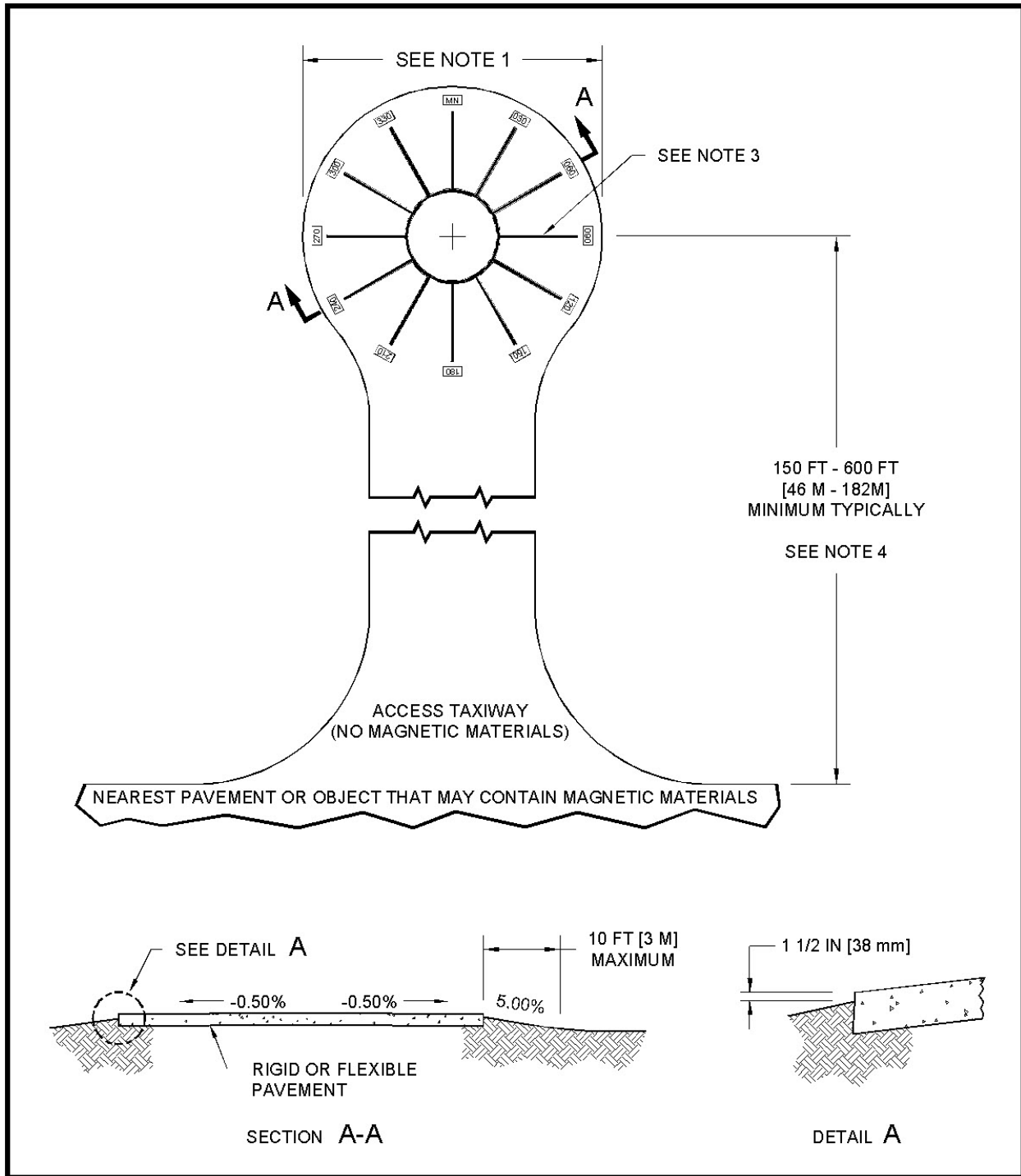


Figure A6-1. Compass calibration pad marking layout



Notes:

1. Diameter of calibration pad varies depending on requirements of user aircraft.
2. Use aluminum or non-metallic pipe when drainage is necessary with 150 ft (46 m) of the center of the pad.
3. See Figure A6-1 for marking layout.
4. Varies per site conditions and airport design criteria. Refer to paragraph A6-3.

Figure A6-2. Typical compass calibration pad

A6-4. Location of compass calibration pad.

The requirements specified herein have been determined through consultation with instrument calibration specialists, Fixed Base Operators (FBOs), and persons in the US Geological Survey with considerable experience in performing surveys of compass calibration pads.

a. Locate the center of the pad at least 600 feet (183 meters) from magnetic objects such as large parking lots, busy roads, railroad tracks, high voltage electrical transmission lines or cables carrying direct current (either above or below ground). Locate the center of the pad at least 300 feet (91 meters) from buildings, aircraft arresting gear, fuel lines, electrical or communication cable conduits when they contain magnetic (iron, steel, or ferrous) materials and from other aircraft. Runway and taxiway light bases, airfield signs, ducts, grates for drainage when they contain iron, steel, or ferrous materials should be at least 150 feet (46 m) from the center of the pad. In order to prevent interference with electronic Navigation Aid (NAVAID) facilities located on the airport, be sure the required clearances are maintained in accordance with the requirements in Chapter 6.

b. The compass calibration pad must be located outside airport design surfaces to satisfy the runway and taxiway clearances applicable to the airport on which it is located.

c. After tentative selection of a site through visual application of appropriate criteria listed above, make a thorough magnetic survey of the site(s). Many sites which meet all visually applied criteria regarding distances from structures, etc., may still be unsatisfactory because of locally generated or natural magnetic anomalies. At locations near heavy industrial areas, intermittent magnetic variations may be experienced. Appropriate magnetic surveys at various periods of time are necessary to determine if this situation exists.

d. The difference between magnetic and true north (referred to as magnetic variation or declination) must be uniform in the vicinity of the site. Magnetic surveys must be made to determine that the angular difference between true and magnetic north measured at any point does not differ from the angular difference measured at any other point by more than one-half degree (30 minutes of arc) within a space between 2 and 10 feet (0.5 and 3 meters) above the ground above the surface of the base and extending over an area within a 250-foot (76 meters) radius from the center of the pad. Exceptions can be made for small anomalies provided it can be shown through the magnetic surveys to have no effect on any magnetic measurements on the paved portion of the compass calibration pad. All exceptions must be noted in the compass rose report and certification that must be provided by the geophysicist, surveyor or engineer making the magnetic surveys.

e. A suggested method for the magnetic surveys is described below:

(1) Make a preliminary total field survey of the (proposed) pad and surrounding area using a total field magnetometer. Measurements should be made in a grid pattern with 5-foot (1.5 m) spacing on the (proposed) pad, 10-foot (3 m) spacing from the edge of the (proposed) pad to 150-feet (46 m) from the center, and 20-foot (6 m) spacing on the cardinal headings (north, south, east, and west) out to 250-feet (76 m) from the center of the pad. The reading on the (proposed) pad should have a range of 75 nT (nanoTesla) or less. The range

should be 125 nT or less from the edge of the (proposed) pad out to 150-feet (46 m) from the center of the pad, and a range of less than 200nT from 150-feet (46 m) out to 250-feet (76 m) from the center of the (proposed) pad. Several sites can typically be evaluated in a day using this method. Once a suitable site is located, proceed to the next step.

(2) Establish a grid centered on the pad with 20-foot (6 m) to 30-foot (9 m) spacing. There will typically be 5 or 7 lines. Place azimuth stakes at one end of the grid lines at least 400-feet (122 m) from the center. Establish the true azimuth of the grid by Global Positioning System (GPS), solar or star observations, or gyrocompass. Locate a minimum of 8 additional points, 100-feet (30 m) and 200-feet (61 m) respectively, from the center of the pad on the 4 cardinal headings of the grid. Establish a true azimuth to at least 3 permanent objects on or near the airfield from the center of the (proposed) pad. The true azimuths will be used to locate the magnetic radials and for future magnetic surveys.

(3) Measure declination at each grid point and each additional point. During the measurement of declination, the center point must be re-occupied approximately every 30 minutes in order to determine the diurnal (daily) variation of the magnetic field in order to cancel the diurnal change from the readings and to determine the average value of declination.

(4) Mark on the pavement the location where radials must be painted within 1 minute of the magnetic bearing indicated.

(5) Submit a written report to the airport or agency requesting the surveys. The report should include all results, equipment calibration information, and a drawing showing the declination survey results.

A6-5. Construction of compass calibration pad.

For pavement design and construction, the applicable portions of AC 150/5320-6 and AC 150/5370-10 should be used. The following additional information is important:

a. Do not use magnetic materials, such as reinforcing steel or ferrous aggregate, in the construction of the calibration pad or of any pavement within a 300-foot (91 m) radius of the center of the site. If a drainage pipe is required within 300 feet (91 m) of the center of the site, use a non-metallic or aluminum material.

b. Each of the radials is oriented within one minute of the magnetic bearing indicated by its markings.

c. Mark the date of observation and any annual change in direction of magnetic north durably and legibly on the surface of the calibration pad near the magnetic north mark. Establish a permanent monument at some remote location on the true north radial for future reference.

d. After all construction work on the compass pad is completed, the pad must be magnetically resurveyed to show that magnetic materials were not introduced during construction and to establish the current magnetic headings.

e. Magnetic surveys of existing compass calibration pads must be performed at regular intervals of 5 years or less. Additional surveys must be performed after major construction of utility lines, buildings, or any other structures within 600 feet (183 m) of the center of the pad or after any construction within 150 feet (46 m) of the center of the pad. Pads not resurveyed after 5 years or after nearby construction should not be used.

f. The U.S. Geological Survey (USGS) of the Department of Interior is available to provide information to airports and others on the necessary surveys and equipment to certify a compass rose. In addition, the USGS is available to calibrate magnetometers and other suitable instruments used to measure the magnetic field. The instruments are necessary to determine the difference between true and magnetic north and the uniformity of the magnetic field in the area of a compass calibration pad and must be regularly calibrated to make accurate measurements. The cost for calibration service is only that necessary to cover the cost. Requests for this service should be made to the following:

U.S. Geological Survey
Geomagnetism Group
Box 25046, MS 966
Denver, CO 80225
Tel: 303-273-8475
Fax: 303-273-8450
website: geomag.usgs.gov

There are also many other competent geophysicists, surveyors or engineers who are capable of performing compass rose surveys.

APPENDIX 6

ADVISORY CIRCULAR AC 150/5340-1M STANDARDS FOR AIRPORT MARKINGS

AC 150/5340-1M is updated for the latest changes as of 5/10/2019. This AC is to be used for any runway or taxiway markings such as runway numbers, thresholds, centerline strips, etc.

This document has color illustrations and is 172 pages long. Should your chapter decide to take on a runway or taxiway line marking project, you must follow this AC. Please note the graphics for the lettering and numbering of a runway are different than that shown in Appendix 2.

To find the latest edition, including any changes, go to www.faa.gov. Under the **Regulations and Guidelines** section, click on the **Advisory Circulars (ACs)** link. The easiest way to find the referenced AC is to put 150/5340-1 in the search box and click on **Go**. Note: I did not include the alphabetic character in the search. This way, you should find out if there is a revision later than 150/5340-1M.