



Corporal™

Flying Model Rocket Instructions
Designed by Matt Steele

VEHICLE DATA SHEET

Physical Data

Parameter	Dimension
Length	58" (147 cm)
Diameter	2.64" (6.7 cm)
Weight	24 oz (680 g)
Recommended Motors:	Aerotech F42-4T, F52-5C, G54-6W, G71-7R, G75-6W, G76-7G, G77-7R, G78-7G, G80-7NT

Predicted Altitudes

Motor	Predicted Altitude
Aerotech F42-4T	585 ft (178 m)
Aerotech F52-5C	817 ft (249 m)
Aerotech G71-7R	1,328 ft (405 m)
Aerotech G76-7G	1,450 ft (442 m)
Aerotech G80-7	1,748 ft (533 m)

• A 36" nylon parachute is not included in this kit. The NCR 36" Ripstop Nylon High Visibility Parachute (Part #822) is recommended for this kit.

• This kit is recommended for adults (18 and older) only. Launch systems, model rocket motors, launch supplies, tools, and building materials are not included.



- Do not modify the design of the rocket! Changes to the design may affect the stability, and hence, the safety of the rocket.
- North Coast Rocketry certifies that it has exercised reasonable care in the design and manufacture of its products. However, as we cannot control the use of our products once sold, we cannot assume any responsibility or liability for product usage.
- North Coast rocketry shall not be held responsible for personal injury or property damage resulting from the use of our product. The buyer assumes all risks and liabilities arising from the use of our product and uses our product on these conditions.
- North Coast Rocketry makes no warranty regarding our products, except for defects in materials or workmanship for a period of one year after purchase.
- If any of these terms are unacceptable, please return the item to the point of purchase.

NCR 9212 (01/22)

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ID	Part #	Description
A	3001	Nose Cone
B	1108	Main Body Tube
C	1115	Motor Tube
D	1110	Slotted Tube – Fin Can
E	TBD	Corporal Fins (4)
F	1104	Payload Tube
G	2104	Ring Alignment Key (2)
H	2102	Forward Centering Ring
J	2101	Aft/Mid Centering Ring (2)
K	9501	Launch Lugs (2)
L	9540	Cable
M	9503	Loop Sleeve Connectors (2)
N	9504	Kevlar Line
O	9505	Elastic Line
P	1108	Coupler (2) (1 Brown; 1 White)
Q	9508	Bulkhead Plate
R	9536	Eye Bolt with washers and nuts
S	9523	Shrink Tube (2)
T	9526	Quik Link
U	9597	Balsa Conduit Material
V	9598	Conduit Marking Guide
W	8229	Corporal Decal
X	8200	NCR Decal

• A 36" nylon parachute is not included in this kit. The NCR 36" Ripstop Nylon High Visibility Parachute (Part #822) is recommended for this kit.

Before You Start:

Thank you for purchasing this North Coast Rocketry® model kit. We hope you have an enjoyable time constructing and flying this model rocket. Please read all of these instructions to become familiar with them before starting construction. The sequence is important. Check off each step as it is completed.

The following materials are necessary for construction:

5 minute epoxy; 15 or 30 minute epoxy; gap filling (thick) cyanoacrylate adhesive (CA); balsa filler coat; masking tape, an 18" (45.7 cm) wood dowel; a sanding block with #220, #320 and #400 sandpaper; spray primer; and spray paint in the color(s) of your choice.

The following tools are required for construction:

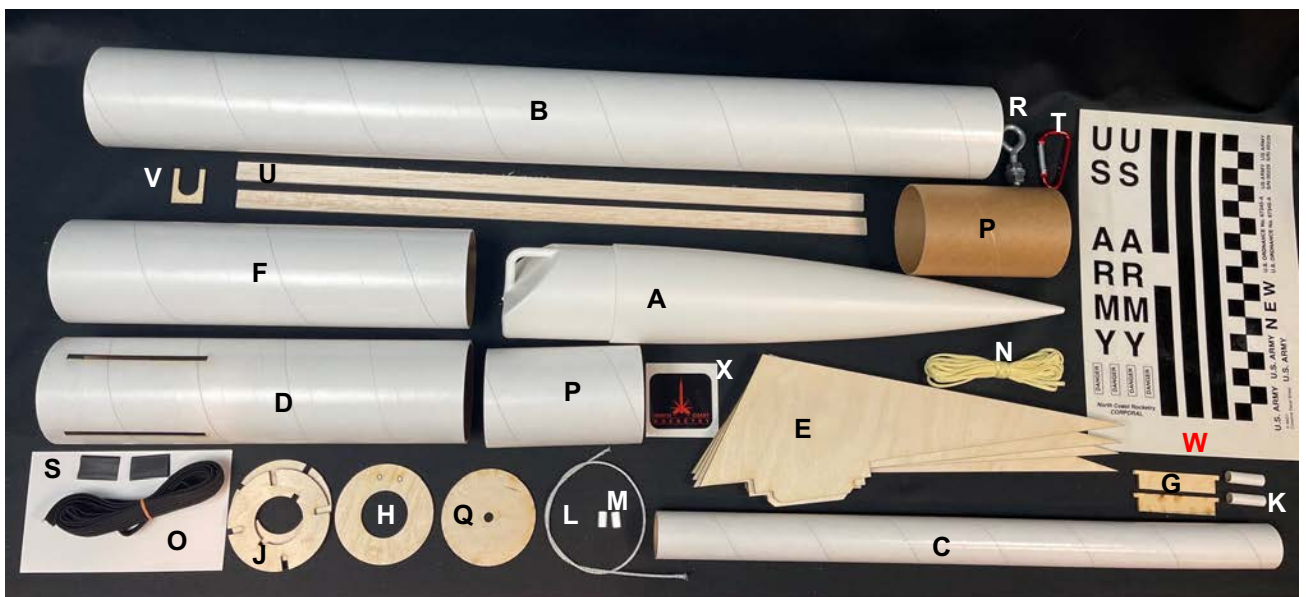
Modeling knife or single edge razor blade; pliers or crimping tool; safety glasses; heat gun; NCR Airfoil Assistant (Large) and an 18" long ruler.

Check the kit for completeness, using the parts list and reference photograph. If parts are missing or damaged, or if for any reason you are dissatisfied with this product, please let us know at www.NorthCoastRocketry.com. We will gladly replace any item found to be defective. Our goal is for you to be satisfied with your purchase, and to have fun!

Please be extremely careful using CA and epoxy. Avoid getting either in your eyes or on your skin. Use safety glasses when using adhesives and when cutting. Be sure to use adhesives and paints only in areas with adequate ventilation, and do not breathe in fumes.

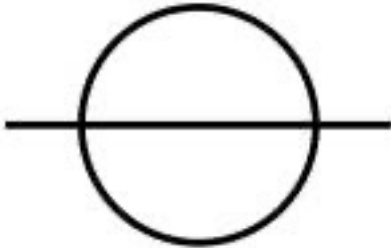
In each step, test fit parts together before bonding. It is sometimes necessary to sand lightly or build up some parts to obtain a precision fit.

Plywood parts, being natural wood products, have a tendency to warp. Reverse any warps by lightly misting the part's concave side, then placing it between two heavy, flat objects to dry. Seal the part with balsa fillercoat or spray primer as soon as possible afterwards.

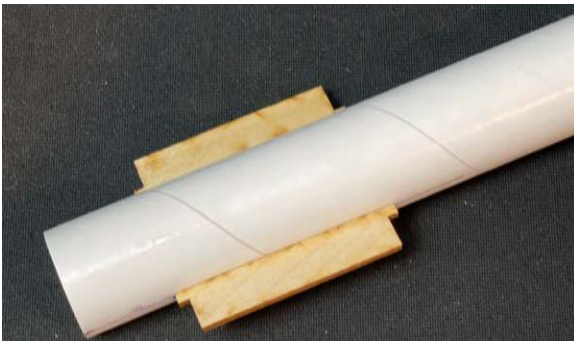


Assembly Instructions

- Mark the motor tube with two marks 180° apart, using the marking guide below. Extend both lines 6”.



- Mark the motor tube 1” from each end. Extend those lines around the circumference of the tube.
- Test fit each centering ring on the motor tube and body tube to ensure they fit properly. Sand the rings if the fit is too tight; add tape to the motor tube if that joint is too loose.
- Locate two centering ring alignment keys. These pieces will keep the aft and mid centering rings aligned properly to fit the fin tabs. Using CA, glue the key on one of the lengthwise lines, 1” from one end. Repeat with the other key on the other line.



- Locate one of the aft/mid centering rings (one with the four slots in it) and slide it onto the motor tube to mate with the key. Using epoxy, bond the ring in place. Repeat with the other ring in the mid location. Fillet both rings to the tube. Set aside to cure.



- Test fit the motor mount assembly into the slotted airframe “fin can” tube. Check to see that the motor mount fits snugly. Remove the motor mount. Using 15 or 30 minute epoxy, apply a band of epoxy inside the slotted tube about 3” from one end. Insert the motor mount assembly into the tube about 2”. Apply additional epoxy band about ½” inside the tube. Then, insert the assembly all the way in until the aft centering ring is at least even with the aft slot. **Before the epoxy sets, make sure that the fin slots and the notches in the centering rings are aligned with the fin can tube by test fitting each fin into each slot.** Set aside to cure.



- Locate the white coupler; mark it at half its length. Test fit it in the slotted tube assembly up to the mark. Remove the coupler, and apply epoxy to the inside of the tube, and re-insert the coupler up to the mark. Set aside to cure.



- Locate the forward centering ring (the one with the two holes in it) and slide it onto the motor tube to one of the 1” marks. Using epoxy, bond the ring in place. Set aside to cure.



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□ Locate the steel cable and one of the loop/sleeve connectors. Thread one of the loop/sleeve connectors on to the cable. Then, thread the cable down through the top of one hole in the centering ring. Pull it back through the other hole and thread the end of the cable back through the loop/sleeve connector, making a 1-2" loop. Crimp the loop/sleeve connector with a crimping tool or a pair of pliers. Apply a drop of CA to the connector.



□ Place the other loop/sleeve connector on the free end of the cable. Slide both of the heat shrink sections onto the cable. Make a 1-2" diameter loop and thread the free end back through the loop/sleeve connector. Measure the length of the cable with the loops. It should **NOT** be any longer than 16" from the top of the centering ring to the top of the other loop, or it will hang outside the tube at ejection and cut the tube. Crimp the loop/sleeve connector with a crimping tool or a pair of pliers. Apply a drop of CA to the joint. Slide the heat shrink tubing over each loop sleeve connector, and, using a heat gun or hair dryer, shrink the tubing over the connector to prevent the parachute from snagging on it.



□ Tie one end of the Kevlar shock line onto the top cable loop and triple knot it. Secure the knot with a drop of CA. Trim the excess off.

□ Tie one end of the elastic shock line onto the top cable loop and triple knot it. Trim the excess off.



□ Coil up both the Kevlar and elastic shock lines and stuff them into the forward end of the motor tube. This will keep them out of the way when the motor mount is bonded in place.

□ Test fit the fin can assembly into the main airframe tube. Check to see that the coupler fits snugly. Using 15 or 30 minute epoxy, apply a band of epoxy inside the main airframe tube about 4-5" from one end. Insert the fin can assembly into the main tube about 2". Apply another band of epoxy 1-2" inside the main airframe tube. Then, insert the fin can assembly all the way in until the two tubes are seated against each other. Set aside to cure.

□ Locate the fins. Round the leading and trailing edges of the fins with coarse #100 grit sandpaper. The NCR Airfoil Assistant (Large) makes this jog a lot easier. Leave the root edge of the fins flat. Fine sand the parts with #180, #220, #320, and #400 sandpaper. Plywood is a natural wood product; as such, we can not control factors such as warping after it leaves our facility. If your plywood parts are warped, place them under a stack of books for 24-48 hours to flatten them.

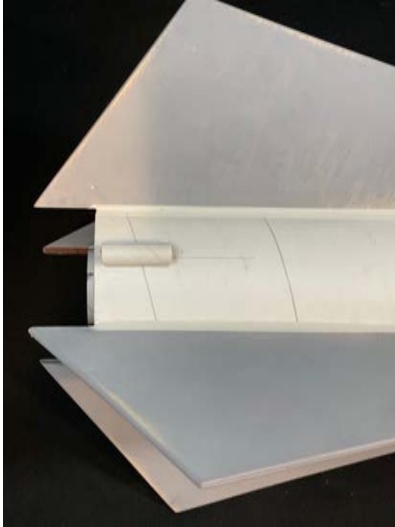
□ It is a good idea to sand and seal the fins prior to bonding them on the airframe. Cover the fin tab area with a strip of masking tape. The fins can best be sealed with finishing epoxy, balsa filler coat, or primer paint. Apply a coat of filler, sand smooth, and repeat the process until the wood grain is filled and the surfaces are smooth.

□ Using epoxy, glue the fins in place on the lower body tube. Fillet each fin/body joint.



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- Using a pencil and a straight edge, extend a 2" line in between two of the fins on the lower body. Make another mark 1/8" from the end of the tube. Locate one launch lug and epoxy it in place. Fillet the lug for added strength.



- Locate the remaining brown coupler; mark it at half it's length.



- Locate the eye bolt, washers, and nuts. Thread one nut on to the eye bolt; then add a washer; the bulkhead plate; the remaining washer; and the nut. Tighten the nut and then apply a drop of CA to secure the assembly. Run a thin bead of CA around the washers on both sides of the plates.

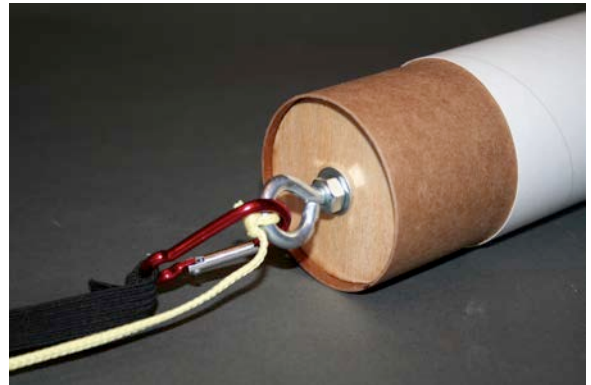


- Epoxy the bulkhead plate into the aft end of the brown coupler with the eyebolt facing out.

- Sand the inside of the payload tube to allow the coupler to slide inside. coupler; mark it at half it's length. Test fit it in the slotted tube assembly up to the mark. Remove the coupler and apply epoxy to the inside of the tube. Re-insert the coupler up to the mark. Set aside to cure.

Sand the coupler to ensure it slides smoothly in the main tube.

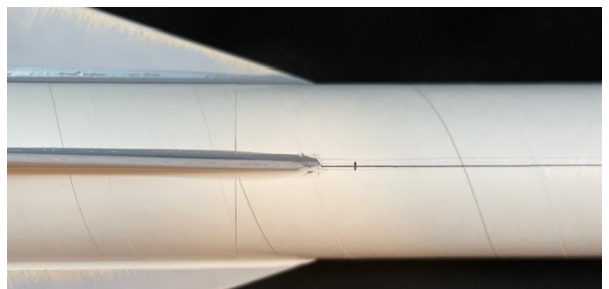
- When the epoxy on the bulkhead plate has cured, tie the free end of the Kevlar line to the eyebolt. Secure the knot with CA. Locate and tie the free end of the elastic to the Quick Link, then attach the Quick Link to the eyebolt.



- Using a pencil and a straight edge, extend a 2" line on the payload tube. Mark it 1/2" from the end. Locate one of the launch lugs and epoxy it in place. Fillet the lug for added strength.

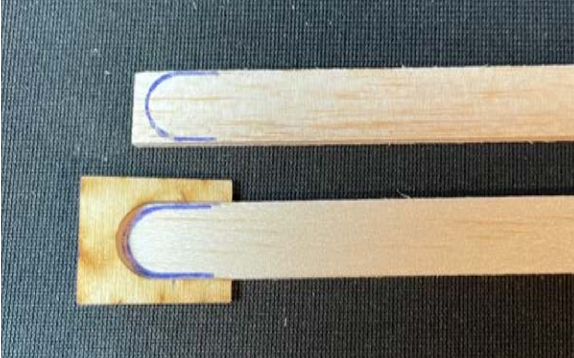


- Using a pencil and a straight edge, extend a line the full length of one main tube 1/2" above the fin. Repeat for the fin 180 degrees opposite the first one. This is where the conduits will go.



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- Using the conduit cutting guide, mark each of the two balsa conduits as shown. Cut away the top part of the balsa stick.



- Carefully sand the contour of the tube into one flat side of the conduit. Fine sand each conduit with #220, #320 and #400 sandpaper to minimize the wood grain to be filled.
- Apply a thin coat of five-minute epoxy to the concave sanded side of the conduit and glue in place. Repeat for the other conduit once the adhesive has set.



- Trim any flash away from the nose cone with a sharp knife. Sand lightly with #400 sandpaper before painting. Friction fit the large nose cone into the payload tube with masking tape so that it is secure.
- Clean the rocket body with a rag or paper towel. The rocket may now be painted.
- Paint the all parts with a base coat of primer and let it dry. For best results, apply two coats of white paint before applying the final color coat.
- Attach a 36" parachute (not included) to the screw eye.
- Apply the "stick and peel" decals. Refer to the photos for placement. Carefully cut out each decal from the sheet, leaving as little extra material around the printed portions. Remove the backing paper and position the decal on the model. Burnish the decal to stay in place.
- Spray the entire model with a clear coat to protect the finish.



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Flight Preparations

IMPORTANT! READ BEFORE LAUNCHING!

- Select one of the recommend motors shown on the first page. For an updated list of recommended motors, check the kit listing at NorthCoastrocketry.com.
- Install the motor into the motor mount until all but the last ½" in exposed. Endure the motor is snug in the motor tube, and that it will not move forward or aft. Using ¾" wide masking tape, wrap the aft end of the motor and the motor tube to secure the motor in place. It is critical that the motor be firmly retained. If the motor is loose, it may blow out at ejection, causing the model to crash.
- Remove the payload section. Check to ensure the shock cord is securely mounted. Check for any damaged, burnt or frayed sections of the shock cord or Kevlar and replace if necessary. Install wadding, using an amount at least equal to one diameter (3" or so) to protect the parachute. Insert the shock cord and Kevlar back into the tube.
- Carefully lay the canopy of the parachute out on a flat surface with the underside of the canopy facing up. Pull the shroud lines towards you. Fold the canopy in half by bringing the "top" half of the canopy down toward you. Fold the left corner over to make a quarter disk. Place the shroud lines on the parachute, then fold it lengthwise again. Then, from the top to bottom of the chute, fold it into three sections in a manner resembling a "Z". Place the chute in the tube with the shroud lines facing out.
- Replace the payload section. Ensure the payload section is snug but slides freely.
- Ensure the nose cone fits tight on the payload section tube. Use tape if necessary to shim the nose cone shoulder until it is tight.
- The model's calculated center of pressure is 46.6" aft of the nose cone.
- Check the model's center of gravity prior to flight. **The Center of Gravity (balance point) should be no farther aft than 43.6" aft of the nose tip with the motor, wadding, and recovery system installed.**

Flight Instructions

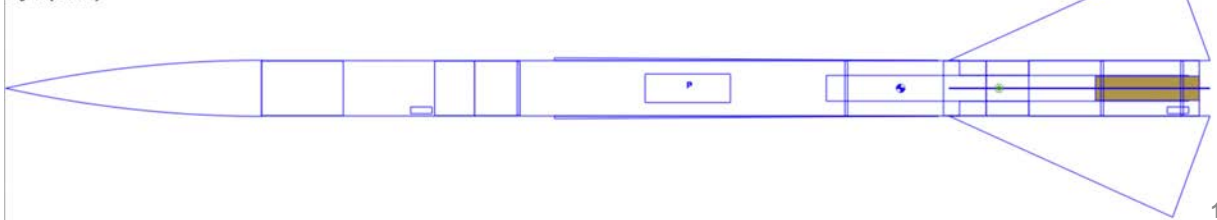
- Install the igniter per manufacturer's instructions.
- Perform a pre-launch check to ensure that:
 - The fins and launch lugs are not broken, damaged, or loose in any way;
 - The body tube and other components are not damaged or dented;
 - The model slides freely on the launch rod or rail, with no binding, sticking or misalignment of the launch lugs or buttons.
 - If any problems are detected, correct them before attempting to fly.
- Fly your rocket from the largest field possible on a clear and calm day. At a minimum, you need a field at least 1.5 times the expected altitude. For example, if you expect your model to fly to 1,000 ft (305 m), then the field should be at least 1,500 ft (457 m) on each side.
- Do not fly near trees, power lines, or tall buildings. Do not fly in the vicinity of low flying airplanes or airports.
- Be sure that the area is clear of dry weeds, grass, or other flammable materials that may be ignited by the rocket exhaust. Always use a large blast deflector.
- Use a launch pad with at least a 5 ft (1.5m) rod or rail. Fly from a minimum distance of 30 ft (9 m) for safety and a better view of the flight.
- Follow ALL Federal, State, and local regulations and ordinances when flying model rockets
- ALWAYS follow the NAR Safety Code when flying model rockets.

Flight Profile

Give a five second countdown to warn all others in the area of a launch. When the launch button is pressed, an electrical current causes the igniter to heat up, igniting the propellant in the motor. This may take as long as one second. The motor quickly builds up thrust and moves the rocket into the air. When the motor's propellant is consumed, a delay grain generates tracking smoke. When the delay grain is consumed near peak altitude, the motor's ejection charge fires, activating the models' recovery system. The recovery system permits the safe landing of the model to the ground.

Fly safely and have fun!

*North Coast Rocketry Corporal
Length: 58.5000 in., Diameter: 2.6299 in., Span diameter: 12.1000 in.
Mass: 22.6097 Oz., Selected stage mass 22.6097 Oz.
CG: 41.9855 in., CP: 46.6070 in., Margin: 1.76
Engines: [G80NT-7]



National Association of Rocketry MODEL ROCKET SAFETY CODE

March 2009 Revision

ALWAYS FOLLOW THIS CODE WHEN USING NORTH COAST ROCKETRY® PRODUCTS!

Materials. I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.

Motors. I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.

Ignition System. I will launch my rockets with an electrical launch system and electrical motor igniters. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.

Misfires. If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.

Launch Safety. I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance.

Join the National Association of Rocketry!
Visit www.nar.org for details!

Launcher. I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use.

Size. My model rocket will not weigh more than 1,500 grams (53 ounces) at liftoff and will not contain more than 125 grams (4.4 ounces) of propellant or 320 N-sec (71.9 pound-seconds) of total impulse.

Flight Safety. I will not launch my rocket at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload in my rocket.

Launch Site. I will launch my rocket outdoors, in an open area at least as large as shown in the table below in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.

Recovery System. I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.

Recovery Safety. I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.

Installed Total Impulse (N-sec)	Equivalent Motor Type	Minimum Site Dimensions (ft.)
0.00--1.25	1/4A, 1/2A	50
1.26--2.50	A	100
2.51--5.00	B	200
5.01--10.00	C	400
10.01--20.00	D	500
20.01--40.00	E	1,000
40.01--80.00	F	1,000
80.01--160.00	G	1,000
160.01--320.00	Two Gs	1,500