

Installation and Operation Manual

for American Safe Room's

Underground Blast Resistant Bomb/Fallout Shelter

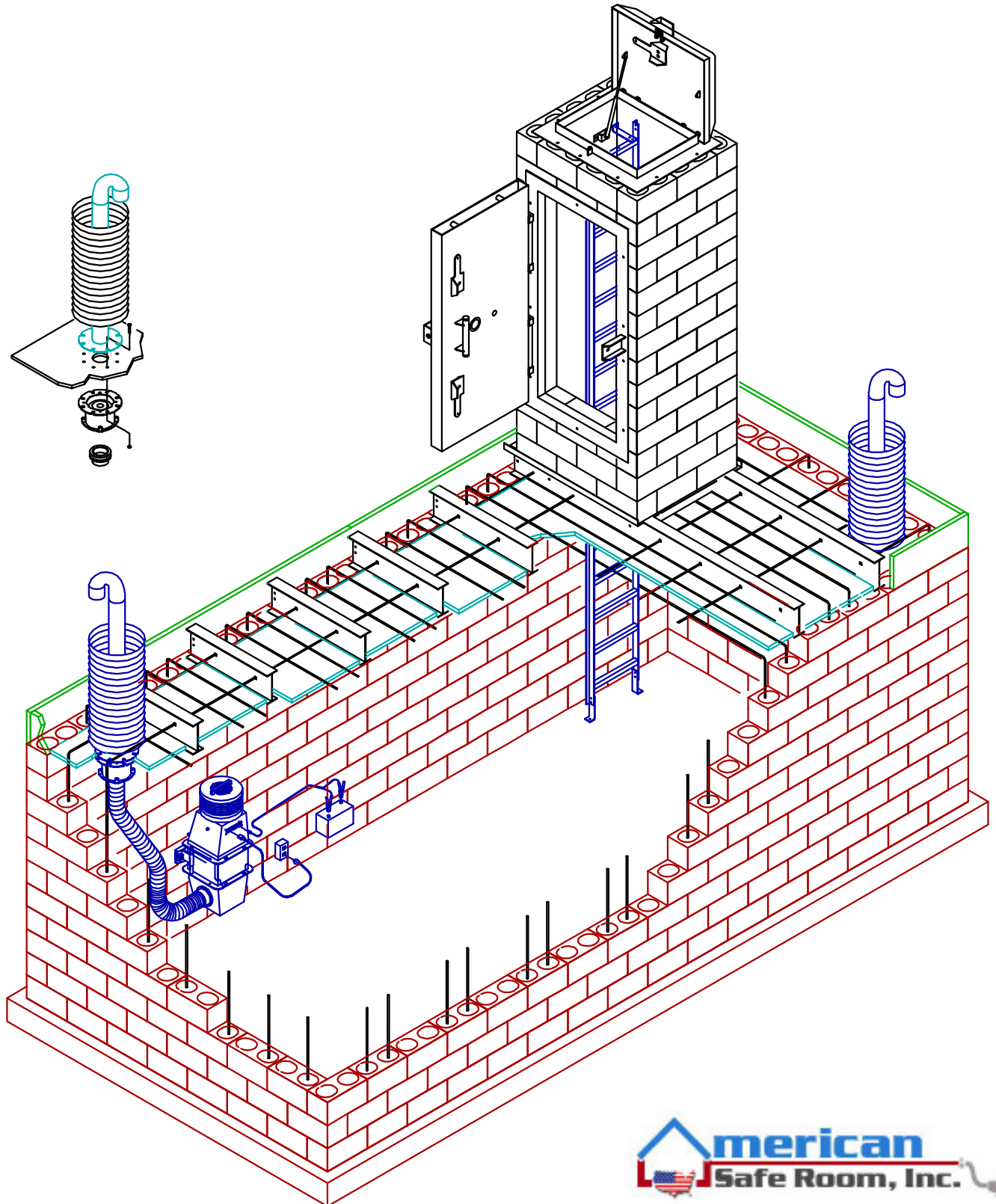


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Note: see page 4 for a “visual” Table of Contents that shows an isometric view of the shelter with the major assemblies listed by section letter.

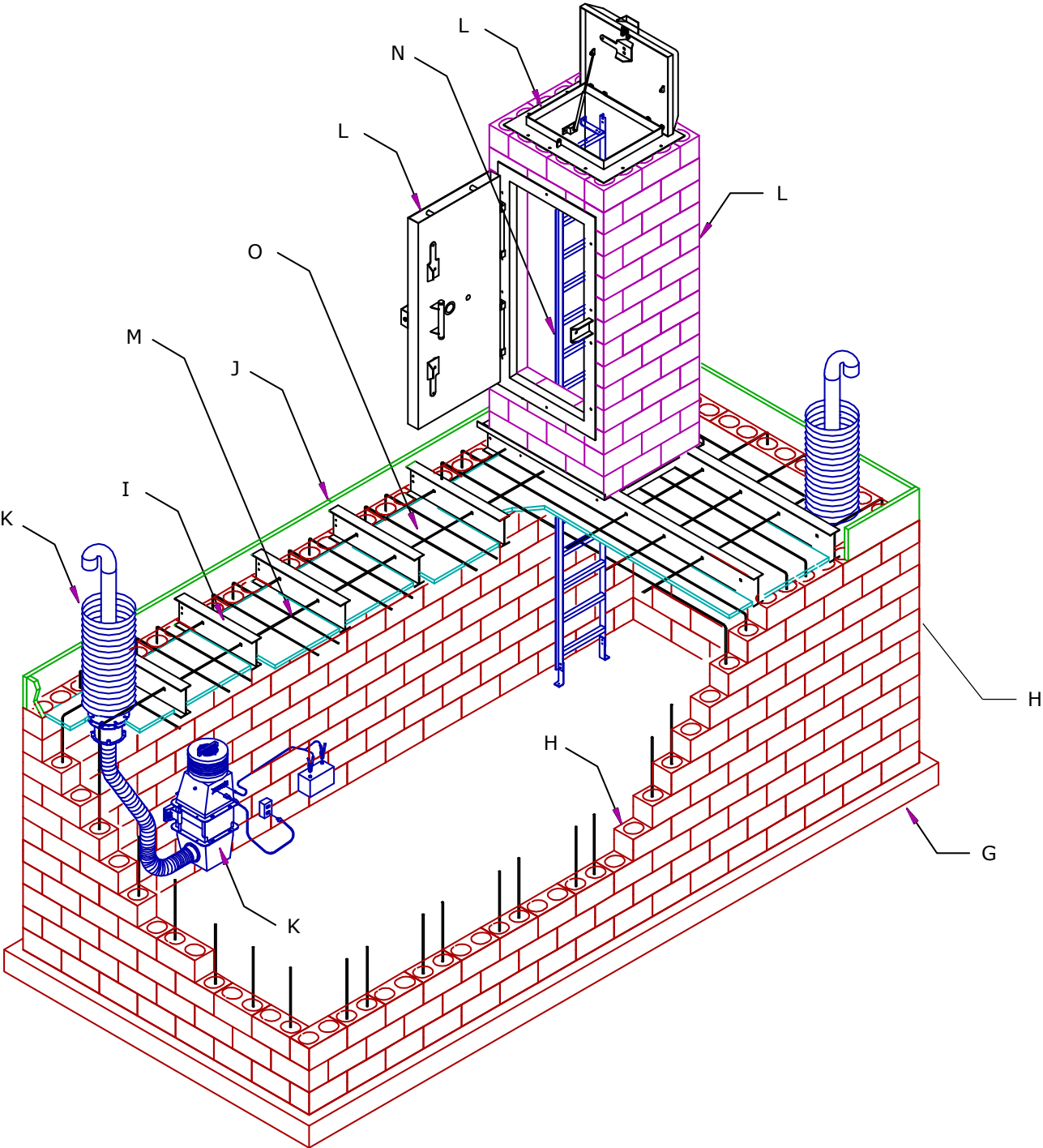
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Table of Contents — assemblies

The letters called out below correspond with the respective section in this manual:



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Forward

This manual is furnished as an information source to our customers. It is NOT to be confused with the "free bomb shelter plans" offers that permeate the internet. This entire kit has been engineered from "below" the ground on up to be a safe refuge in case of nearby catastrophic events such as conventional or nuclear detonations or warfare chemical or biological releases.

The design principals used to develop this kit include economy of price and labor as well as the "human nature" element that has been documented when civil social order breaks down.

The American Safe Room Blast Resistant Bomb/Fallout Shelter System facilitates a simple mechanism to construct a true steel-reinforced concrete underground bunker. Every known (documented) underground bunker that is constructed by people and governments who seem to have unlimited resources use steel-reinforced concrete as a building system. Nobody with unlimited resources buries a culvert and calls it a bunker.

This underground shelter designed to keep you alive during a variety of real-life emergencies. Imagine having a nearby safe place to retreat to in case of terrorist attacks, home invasion robberies, social unrest, or natural disasters. If the roads are clogged and you cannot evacuate, where will you seek shelter?

You may purchase all of the individual kit systems necessary to construct the bunker or you may pick and choose which parts to buy and which parts to make yourself.

The *Detailed Parts Drawings Manual* (a separate document from this one) has all of the manufacturing drawings for the components of the entire structural system and is available from us for a reasonable, refundable price. Please understand that all of these parts require multiple operations in order to make the complete part and that all of these parts must mate with (exactly fit) with the other parts to create a shelter that will withstand a nearby detonation.

The *Detailed Parts Drawings Manual* includes:

- Steel trusses (cut to length and holes made for the rebar)
- Steel riser trusses (special trusses to support the riser)
- Riser bearing plates (smaller trusses that support the riser)
- Truss end brackets (the parts that ensure the trusses are positioned)
- Rebar lengths and formed shapes (exact dimensions for all the rebar)
- Ladder assembly and brackets (complete manufacturing drawings)
- Steel ventilation intake and exhaust piping and connections

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American Safe Room is owned, operated, and located in the United States of America.

Description — general discussion

The purpose of the American Safe Room Underground Blast Resistant Fallout Shelter is to provide an underground protected space that is safe, **economical**, and discrete to construct. A properly constructed, tested, and supplied underground shelter can sustain the occupants through a variety of potential hazards. These include conventional and nuclear detonations, warfare gas events, biological toxin releases, industrial accidents, natural disasters, and other serious social occasions that may cause people around you to behave irrationally.

Previously, the cost of a true **underground steel-reinforced concrete shelter** has been so prohibitive that only wealthy individuals, corporations, and governments have been able to afford them. Almost all of the underground blast-resistant shelters that have been documented have been built out of steel-reinforced concrete.

It is for this reason that American Safe Room has designed an **affordable** underground shelter that can be purchased and installed without the intrusiveness of neighbors knowing that you are prepared for the worst. Prefabricated underground shelters cannot be explained as a wine cellar, basement, or other common underground locations. This comprehensive kit can be installed in the most discrete manner that gives you plausible deniability that you are now equipped with a true underground bomb shelter.

This user-friendly kit ships motor freight (on pallets by a trucking line) with all of the major components necessary to construct the most **cost efficient** below ground shelter possible. We can do this because we put our resources into the design and development instead of economy of construction. By purchasing the bulky, heavy, and easily obtainable items locally, you **save** on shipping costs, you can **shop around** for the best prices, and you have the option to **defray the cost** of the entire structure and installation over several different purchases from several different vendors over the course of the installation.

The American Safe Room Underground Blast Resistant Fallout Shelter can be purchased as a complete system or you may choose from the different components to upgrade an existing fallout shelter or underground location.

The width of the shelter is fixed at 10 feet wide, but the length of 21-feet, 4-inches may be modified longer or shorter in increments of 32-inches.

CAUTION

Be sure to procure your permits first, before ordering your shelter kit.

CAUTION

Do not substitute any of the materials listed in this manual.

CAUTION

Read and **understand** every page of this manual and the related manuals **before** beginning this project. This manual is presented in the order of construction, but there are many sections that **require** you to understand what is going to happen in a subsequent section before completing the previous section. **No section can be assumed to be in isolation of the other sections.**

Description — principals of a protected space

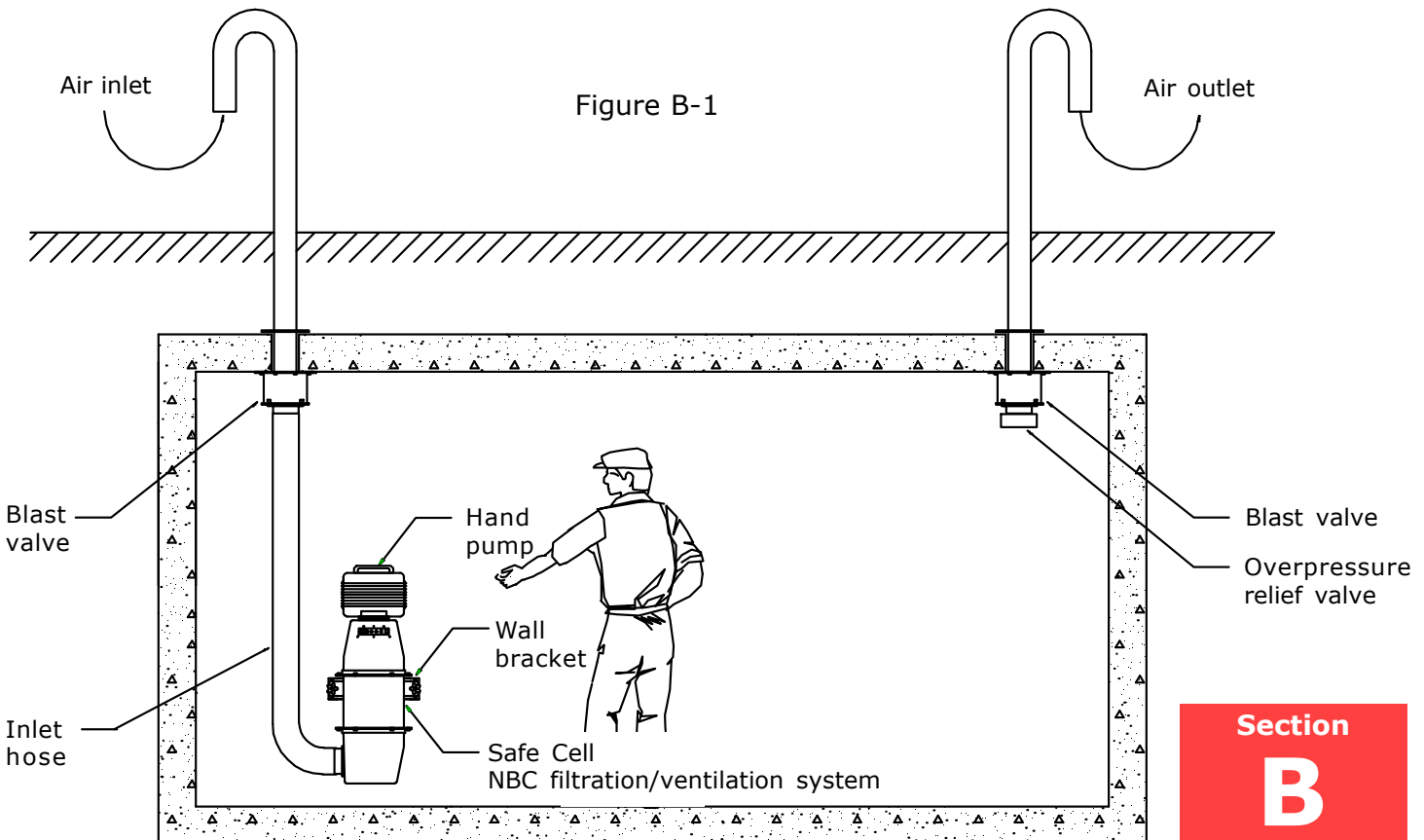
While this shelter is designed to protect the occupants from the kinetic effects (projectiles and debris) of a nearby detonation, a discussion of the nature of air filtration and ventilation in sealed shelters is pertinent to the understanding of this critical aspect of protection.

The inside of a shelter is described as a “protected space.” This term is used to describe any enclosure that denies airborne toxins from entering into that space. In order to protect the occupants, you must control the flow of air through this space. The most efficient means of doing this is with positive pressure (overpressure — or “pressurized” air). In other words, the air inside the protected space is at a **slightly** higher pressure than normal atmosphere, preventing the migration of toxins into the protected space even if it is not sealed completely. If there is a crack or a small hole in the protected space, the positive pressured and filtered (safe and breathable) air inside will flow outward, instead of toxin laden air flowing inwards. Both static and mobile military protected spaces (command/control centers and vehicles such as tanks) all rely upon this principal.

The air that is introduced into your protected space needs to be safe, breathable air that is filtered from **nuclear, biological, and chemical** toxins. This air must be **pressurized** as it is introduced into the shelter until a preset positive pressure (overpressure) is achieved inside the shelter. This is a function of the fan (blower) inside the Safe Cell and the overpressure relief valve working together to control the pressure inside the shelter.

How well the protected space is sealed, and how the air is drawn in, filtered, pressurized, and then expelled must be engineered as a **complete system**. Air acts as a fluid — taking the path of least resistance in the **constant** attempt to **equalize** it’s pressure. This pressure forces the air into your shelter — bringing with it whatever toxins it contains.

The significance of treating your protected space as a complete system and not just a collection of separate components thrown together cannot be overstated.



Description — components of a protected space

All of the components that American Safe Room designs are built to work together in order to achieve and maintain a true protected space. Please see Figures B-1 and B-2 that shows all of these components in their proper place.

Inlet and outlet ventilation pipes

These are heavy duty steel pipes designed to be either poured in place or added to an existing underground shelter. They have a 180 degree bend at the top in order to keep rain, debris, and fallout from entering the pipes.

Automatic double-acting blast valves

These are designed to let low pressure air pass through them in order to allow the Safe Cell to draw air in and the overpressure relief valve to let air out. Their internal valves are in a central, neutral position and can slam shut either way — double acting. In the event of a nearby detonation, the **initial wave** of extremely high (which can be well beyond hurricane strength) air pressure will **automatically** close the valve — keeping this deadly air pressure and the toxins that it contains from entering your protected space. Then, as the air is blown outward from the center of the detonation, a **secondary wave** of vacuum (negative air pressure) will follow. The blast valves will **automatically** close again — ensuring that your protected space does not become a vacuum chamber — a vessel with negative (less than ambient) air pressure. If this happens, as the outside pressure returns to normal, the air (and whatever it contains) will be sucked into your shelter. These two conditions of extremely high **pressure** and **vacuum**, happen very rapidly — in a matter of seconds. As the air pressure returns to normal, the internal valves return to their central, neutral position allowing the relatively low pressures of filtered air from the Safe Cell to pass through them — achieving true ventilation. **Blast valves must be used in pairs** — protecting one ventilation pipe, but not the other is not protection. Pressurized air and vacuum does not care which port it enters and either condition caused by a nearby detonation could be lethal. These blast valves are **heavy steel units** designed with the Israeli standard hole pattern on the mounting flange.

Consult the ASR-48/100N Manual for more information

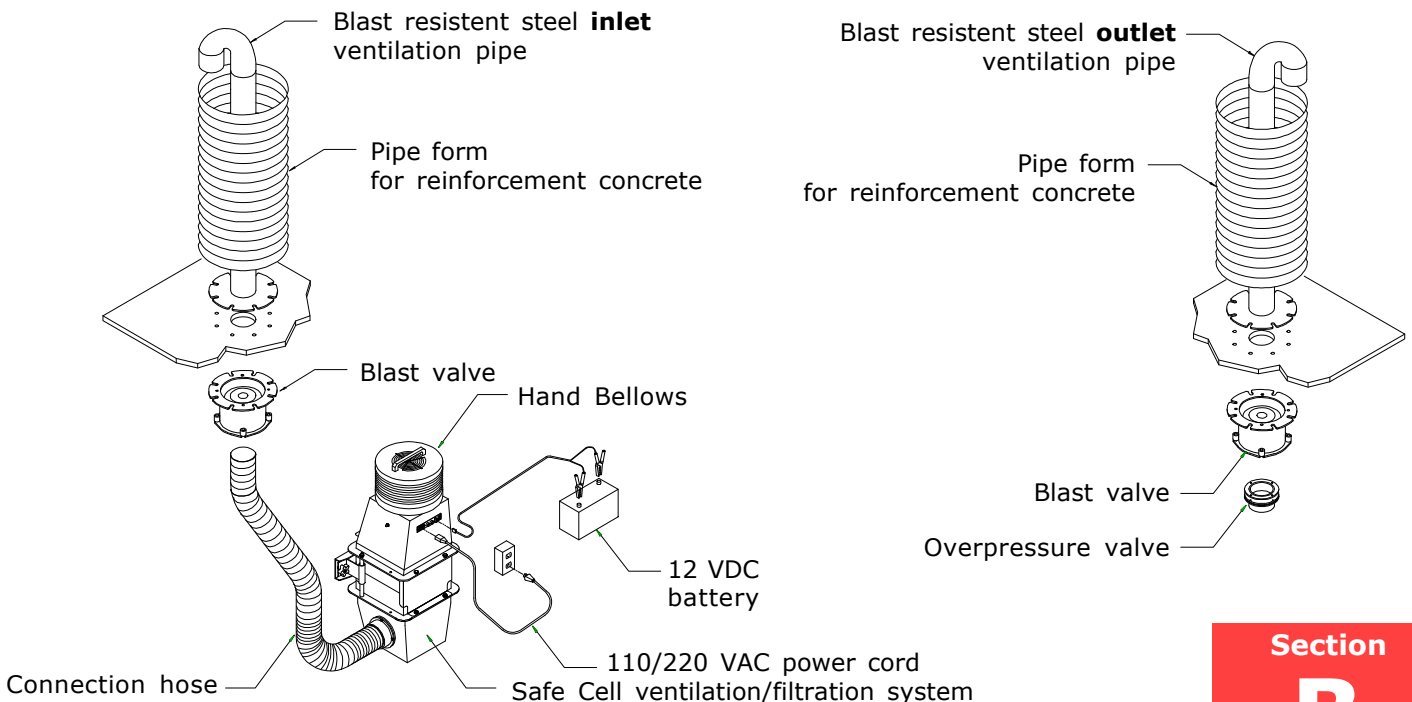


Figure B-2

Description — components of a protected space, continued

The filtration/ventilation system — the Safe Cell

This component consists of an internal blower (fan) and three different types of filters: a pre-filter assembly (gross and fine), a nuclear-grade (individually DOP tested) HEPA filter, and a warfare gas grade carbon adsorber. It also has an **internal** automatic switching power supply that will trickle-charge a user-supplied 12 VDC battery while running on 110-220 VAC. In the event of a power outage, this power supply will **automatically** revert to the battery and keep the blower running — maintaining an overpressure. When the AC power is restored, it will **automatically** revert back to the AC power and recharge the battery. A normal (automotive type) battery will keep the Safe Cell operating from 16 to 24 hours and a deep cycle (marine type) battery will last longer — enough to give you the peace of mind to go to sleep knowing that overpressure will be maintained in your protected space in the event of a power failure.

The secondary backup system — the optional emergency manual air pump

In the event of a long term power outage, even a huge bank of batteries will not suffice to power a blower that is powerful enough to maintain positive pressure in your protected space for very long. The manual air pump installs onto the top of the Safe Cell in about 5 seconds and you can then begin pumping — drawing air into your shelter and displacing (removing) the **carbon dioxide that is exhaled by the occupants**. A person cannot maintain an overpressure by manual power — **no matter what type of motion is used**, but the real danger in a sealed space is carbon dioxide buildup. We know from submarine, mine, and avalanche disasters that humans will succumb to carbon dioxide poisoning long before oxygen deprivation when constrained in an enclosed, airtight space.

The overpressure relief valve

This valve meters out the positive pressure air in the same way that a relief valve on a pressure cooker works. It is calibrated to only release air at a certain pressure so that positive pressure is first created and then maintained in your protected space. Since this is the air outflow port of the protected space, it should be on the **opposite** side of the shelter in order to ensure that the safe, breathable air introduced by the Safe Cell is circulated throughout the shelter.

Description — verifying that you have a true protected space

Test kit

The **optional** test kit provides a means to verify that all of the components of your protected space are working properly. It consists of a differential manometer — which is an instrument that takes two different readings of air pressure. One reading is for the your protected space and another reading is for an adjacent space (outside). It displays the difference of pressures on a scale — like a thermometer. This instrument is used by temporarily routing a flexible tube through a small opening to the adjacent space, turning on your Safe Cell, waiting a short time until the overpressure is created, and then reading the display of the difference in pressures between your shelter and the adjacent space. Another component of this kit are smoke punks — smoke generating devices. They are used by holding them near any likely places inside your protected space that would leak — such as around the hatch or door, the blast valve mounting flanges, or electrical conduit or plumbing fittings. If the smoke either rises straight up or is blown outward due to positive air pressure in your protected space, you have proven that air is not being drawn inward. If the smoke is blown inward, you have proven that there is not enough positive pressure inside your protected space and the area where you tested is not sealed properly.

Differential pressure monitor

For ongoing, real-time data regarding the difference in air pressure between your protected space and the adjacent space (outside), we offer an **optional** differential pressure gauge. This device works similar to the differential manometer in the test kit described above, but it has a dial gauge and is permanently mounted in the hatch or door of your shelter.

Description — entry and exit

There are some options to consider when deciding where and how to position and construct the ingress/egress (enter/exit) points of the shelter.

Since this is designed to be an underground shelter, most options will include what we call a “riser.” That is a shaft designed to convey occupants to and from the shelter up to the surface. It is constructed from concrete blocks, steel reinforcements, and a poured concrete filler. In this shaft, you can have a top opening blast **hatch**, a side opening blast **door**, or both. The risers can be built to any “block” height increment — around 8-inches (8, 16, 24, etc.). You may opt to have more than one riser for redundancy, but remember, all risers must be built over special roof trusses that we call “riser trusses.” These are made to withstand the added weight of the riser and the direct pressure on the riser from the wave of high pressure air that radiates from a nearby detonation. See **Section L — riser construction** for more information.

Both the hatches and doors are manufactured by American Safe Room and engineered to withstand a 50 PSI (pounds per square inch) blast. They feature a lockout mechanism that prohibits unauthorized entry into your shelter when you are **not inside** and the handle (opening mechanism) can be easily removed and taken **into the shelter with you** to deter people from trying to defeat the door and enter your shelter while you **are inside**. They are designed to have the **least advantageous purchase points** possible for leverage devices (crowbars) and pulling devices (tow ropes and winches). In other words, if someone were to **maliciously** desire access to your shelter while you were inside of it, they would find it difficult to locate places on the hatches or doors to gain a purchase to force them open. See **Section N — ingress/egress options** for more information on the hatch and door options.

Both types of doors are fabricated from steel and are purposely constructed as hollow forms. They are pre-hung on a frame with mounting flanges. The heavy-duty mounting fasteners are included. Once the hatch or door is mounted in place, concrete is poured into the cavity of the door by the installer. This internal concrete does several very important things: it makes it nearly impossible for an acetylene cutting torch to burn it’s way through the door, it adds mass that will help to block radiation, it structurally supports the steel skin of the door to add strength, and it makes the door relatively light when mounting on the riser — because the concrete is poured **after** the door is mounted.

Another aspect to consider is how to get the occupants down into the shelter. You can use our ladder system, construct a stair system, or in the near future, we will offer our own integrated stair system as an option. Also coming soon is a powered lift (electrical dumbwaiter) that will use our existing ladder as the rails to allow you to raise and lower heavy items (**not designed or rated for people**) into and out of your shelter. There are many heavy items — such as water (8 pounds per gallon), buckets of grain, or pets that are difficult to convey (up or down) a ladder. See **Section N — ingress/egress options** for more information on the ladder.

Also, as an option, the door may be mounted in the side wall of the shelter. This can be useful if the access to your shelter is through a basement or other existing underground locations. But you **must** allow for the door opening when building the shelter walls.

Description — options

There are many options that you may have with your underground blast resistant shelter. Here are a few of them:

The **length may be changed** (decreased or increased) in 32-inch increments. This dimension is determined by the block spacing. Please contact American Safe Room to find out more information about length options. See *Section A* for our **contact information**.

The **risers structure may be any block height increment** — about 8 inches. And you may have **more than one riser** for redundancy of an ingress and egress point. The riser can have a top mounted, horizontally oriented **hatch** or a side mounted, vertically oriented **door**, or both. Please note that the risers **must** be located on top of the riser trusses — these are constructed of heavier, stronger wide flange beams in order to take the added mass of the riser — and, more importantly the pressure pushing down from a blast wave directly on top of the riser. See *Section L* for information on how the **riser is construction** and see *Section N* for information on **hatch, door, and ladder** options.

You may opt for either an ASR-48-NBC Safe Cell or an ASR-100N-NBC Safe Cell. The ASR-48-NBC puts out 48 cubic meters of safe, breathable air per hour and the ASR-100N-NBC puts out 100 cubic meters of safe, breathable air per hour. The anticipated number of occupants is the major consideration point, but shelter size is also an issue.

You may opt to handle human waste (sewage) internally with a chemical toilet and not plumb your shelter into your existing septic system. See *Section R* for the optional **plumbing connection kit**.

You may opt to have only internal battery power inside your shelter or run electrical wires through conduit into your shelter. We strongly advise **against** any type of generator **inside** the shelter. Carbon monoxide is not something that can be removed by filtration. You can route the exhaust out of the shelter, but even the smallest leak of this exhaust can become dangerous. Remember, you will be in an enclosed space, underground, and possibly without the benefit of relying upon an organized rescue effort if you succumb to carbon monoxide (or carbon dioxide) poisoning. See *Section Q* for the optional **electrical connection kit**.

Our product line has been installed on heavy equipment moving radioactive earth at a former nuclear plant, in bomb shelters, military vehicles, first responder hazardous waste clean up tents, safe rooms, and in our own homes. We can guide you through the selection process. Please see the **contact information** in *Section A*.

Description — major components

This description legend is for Figure B-1 and B-2

- A Blast resistant hatch and ladder
- B Concrete filled blast door
- C Reinforced 10-inch concrete ceiling
- D 10-inch I-beam roof trusses
- E Steel reinforced concrete filled 8-inch block wall.
- F Blast resistant heavy steel ventilation ducts: intake and exhaust
- G Blast valves on intake and exhaust
- H Full NBC positive pressure filtration unit with hand and battery backup

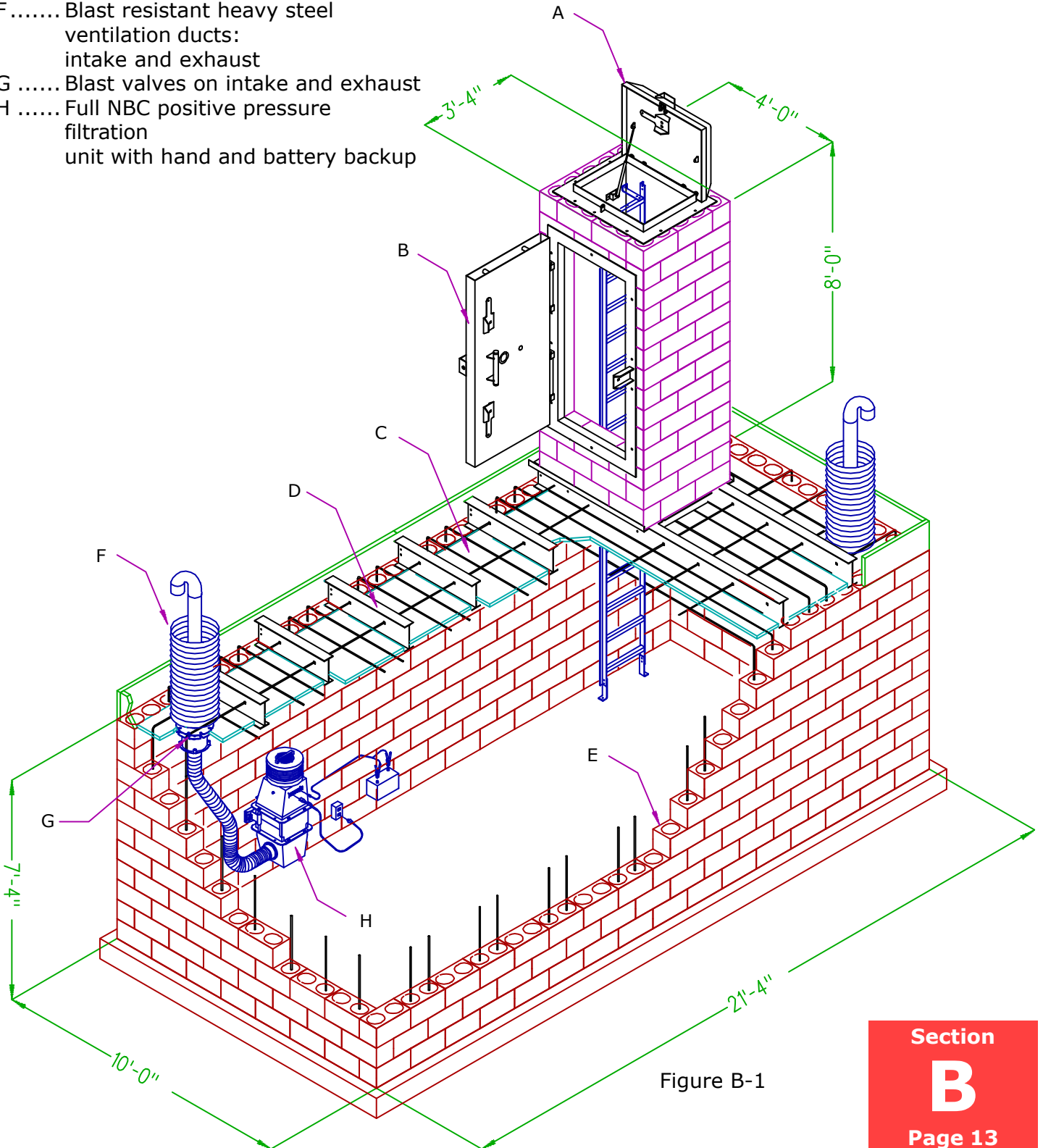


Figure B-1

Choosing the location

Careful forethought and planning must be given before an underground structure is started.

1. The structure or its foundation may not be lower than the high water table.
2. The location should have sufficient slope to allow for surface water drainage.
3. The allowable compaction ratio of the soil at the footing should not be less than a 10,000 pounds per square foot — otherwise a thicker footing may be required.
4. Procure all required local building permits.
5. With fully or partially buried shelters make sure that you have sufficient space and access for needed construction equipment for excavating and lowering the pallets of loaded block into the finished excavation.

CAUTION

Do not attempt to construct your under ground shelter below the high water table, Be sure to consult with a local soil expert or drill appropriate test holes beforehand.

Excavation

For shelters and bunkers that are to be constructed underground it will be necessary to excavate an opening with at least 24 inches of clearance on each side of the wall in order to have the room to construct the shelter walls.

The appropriate slope of the walls of the excavated holes must be maintained in order to prevent sliding of the soil to the bottom of the hole. This angle of this slope is dependant upon the soil type.

The depth of the excavation must include the following variables:

- 1 thickness of the foundation
- 2 height of the wall
- 3 thickness of the ceiling
- 4 thickness of the over cover

The excavation dimensions shown in figure F-1 below are typical for the standard underground shelter described in this manual with an overhead backfill (earth covering) of 20-inches above the typical ceiling depth of 10-inches.

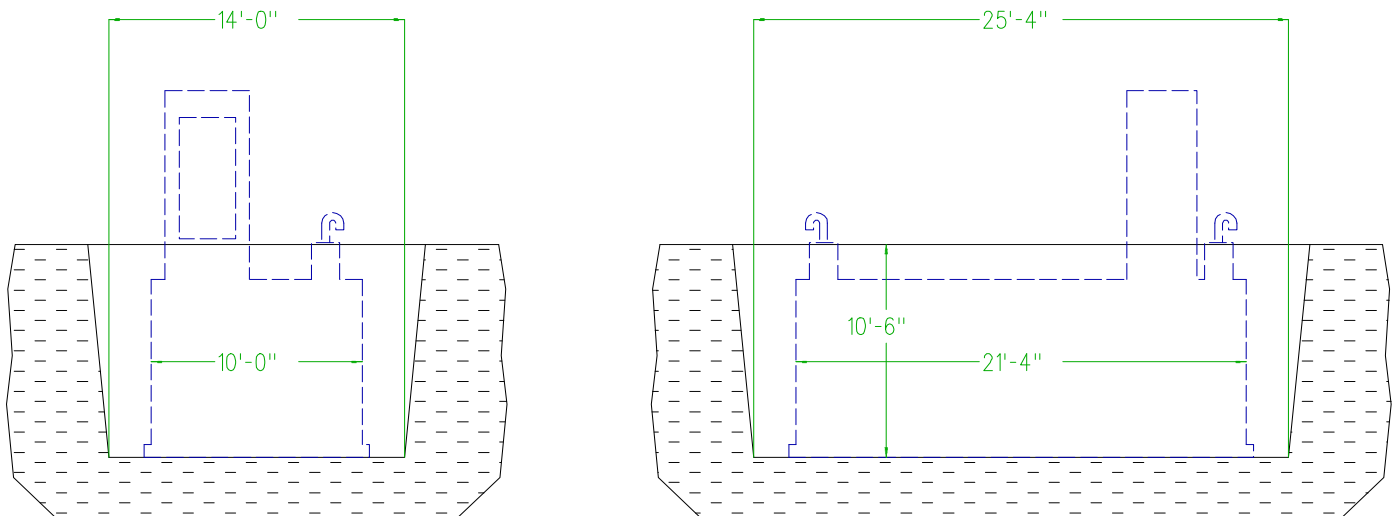


Figure F-1

Building the foundation — overview

The foundation is constructed at the bottom of the excavation from steel reinforced concrete.

The foundation drawings shown in figures G-1 through G-6 are typical for all the optional equipment shown in this manual.

The foundation concrete thickness of 7.1/2-inch is based on a minimum concrete strength of 4,000 pounds per square inch (PSI) placed on an undisturbed or re-compacted soil having a minimum allowable load of 10,000 per square foot.

If either of these conditions can not be met a thicker foundation slab may be required, consult your local building department for direction.

CAUTION

Failure to read, understand, and follow the simple “foundational” requirements above may result in a catastrophic failure of your underground shelter. It may sink farther into the ground, buckle, and/or cave in. **Use the appropriate concrete, pour it as shown in this manual, and know the dirt you are laying it on.**

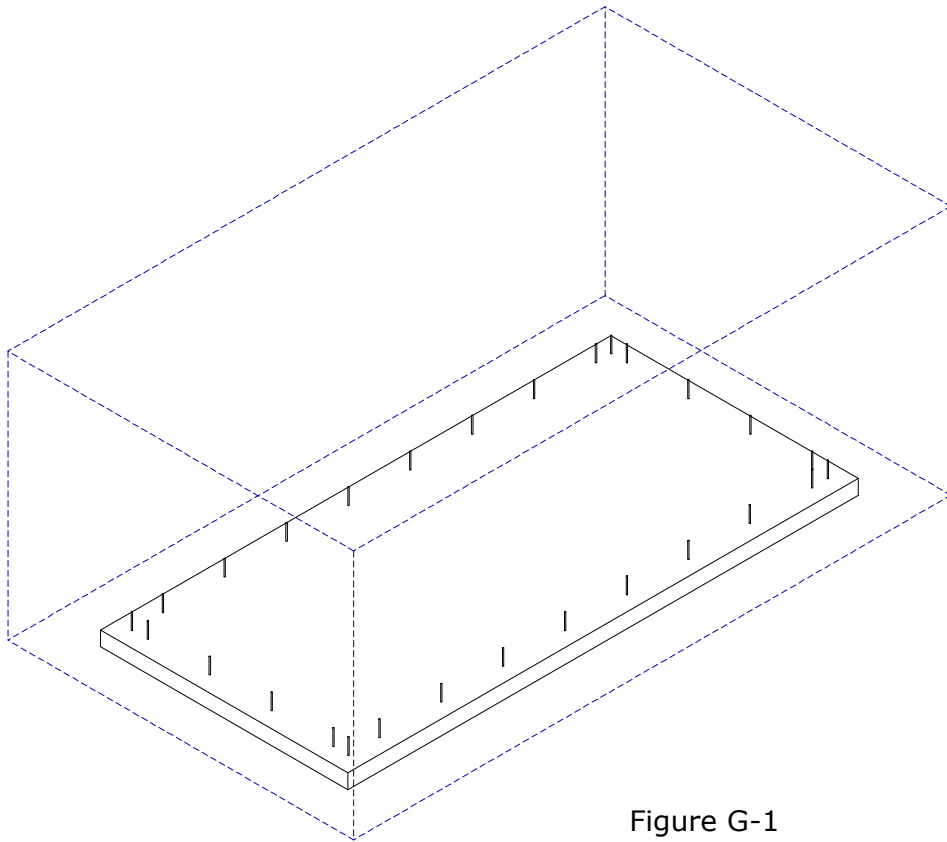


Figure G-1

Building the foundation — form construction

Materials needed:

G-1 ... 2 x 8 inch boards for the side forms

G-2 ... 2 x 4 x 16 inch long support stakes

G-3 ... 2 x 2 x 12 inch long backup stakes

G-4 ... brace boards

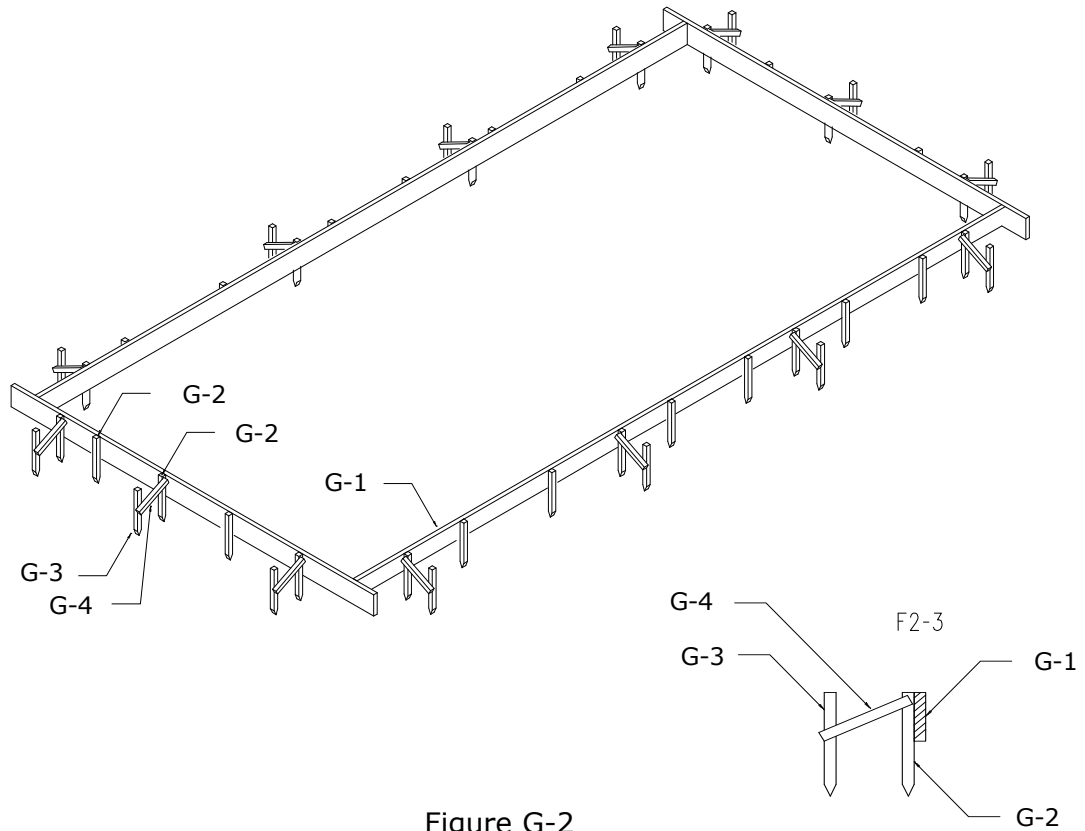


Figure G-2

Stakes every 18-inches with back-ups every 4-feet

Building the foundation — form dimensions

The inside dimensions of the form will be 22-feet long by 10-feet, 8-inches wide by 7.1/2-inches high.

Start by laying out a plumb line, and insure the square by taking a diagonal measure at all four corners on the long axis. All four corners should read the same: 24-feet, 5.3/8-inches.

Using the same procedure recheck the actual wooden form for being square after it's construction — but before the concrete pour.

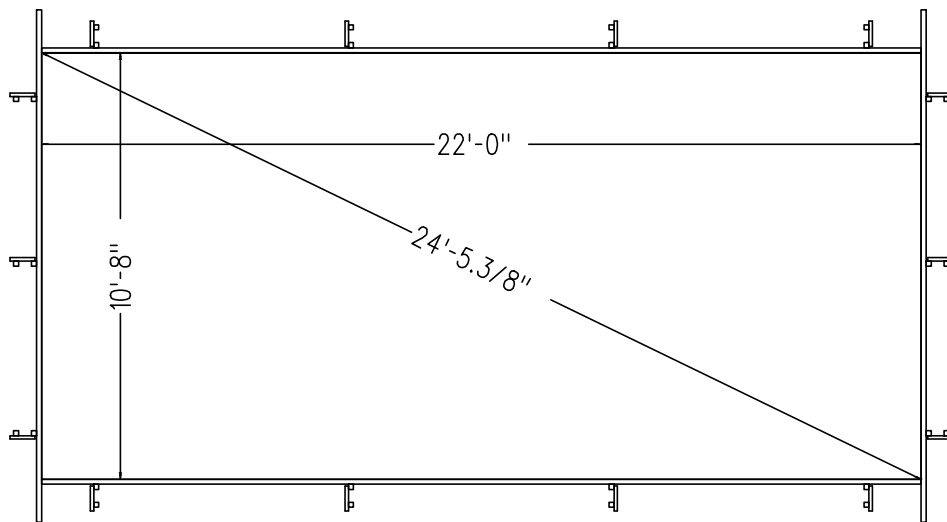


Figure G-3

Building the foundation — laying the rebar

Place 1/2-inch (number-4) rebar, as per figure F-4 through figure F-6

- RB-1 10 pieces latitudinal run, 120-inches in length
- RB-2 12 pieces longitudinal run, 120-inches in length
- RB-3 30 pieces corner bend, 11.3/4-inches x 21-inches

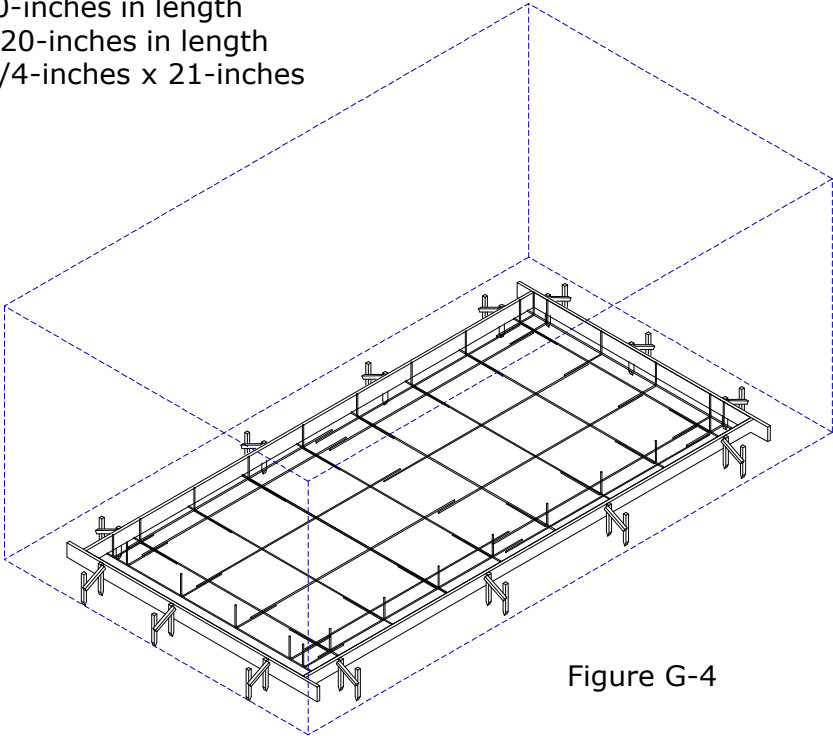


Figure G-4

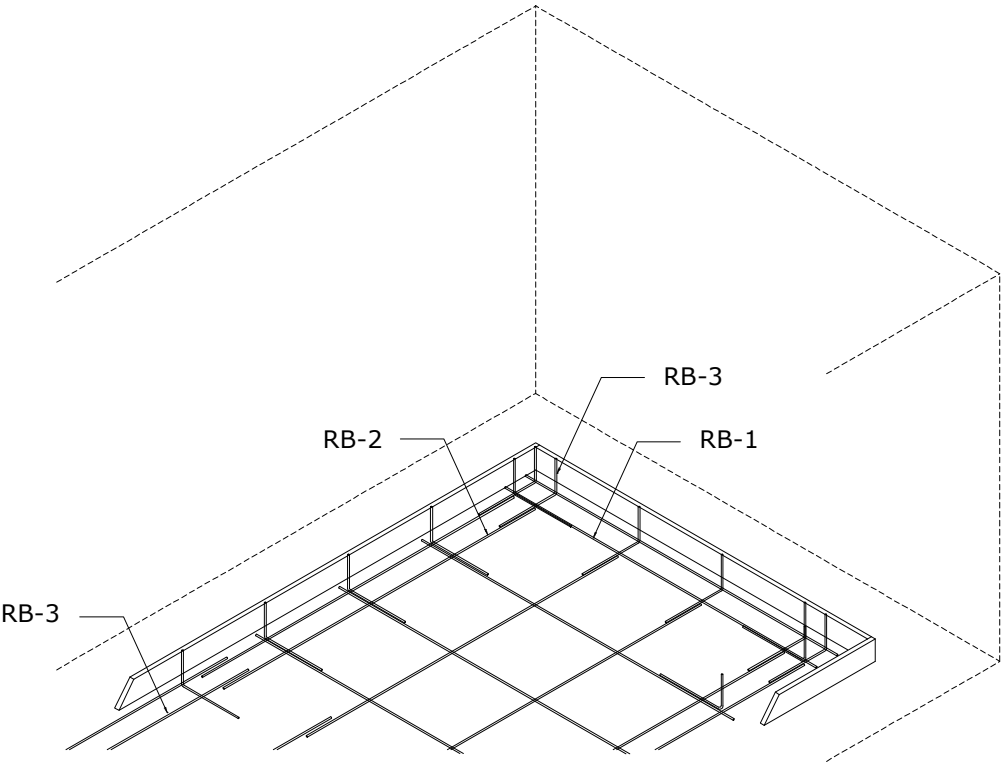


Figure G-5

Building the foundation — laying the rebar, continued

Tie all rebar intersection connections as shown in the rebar tying part of Section M of this manual.

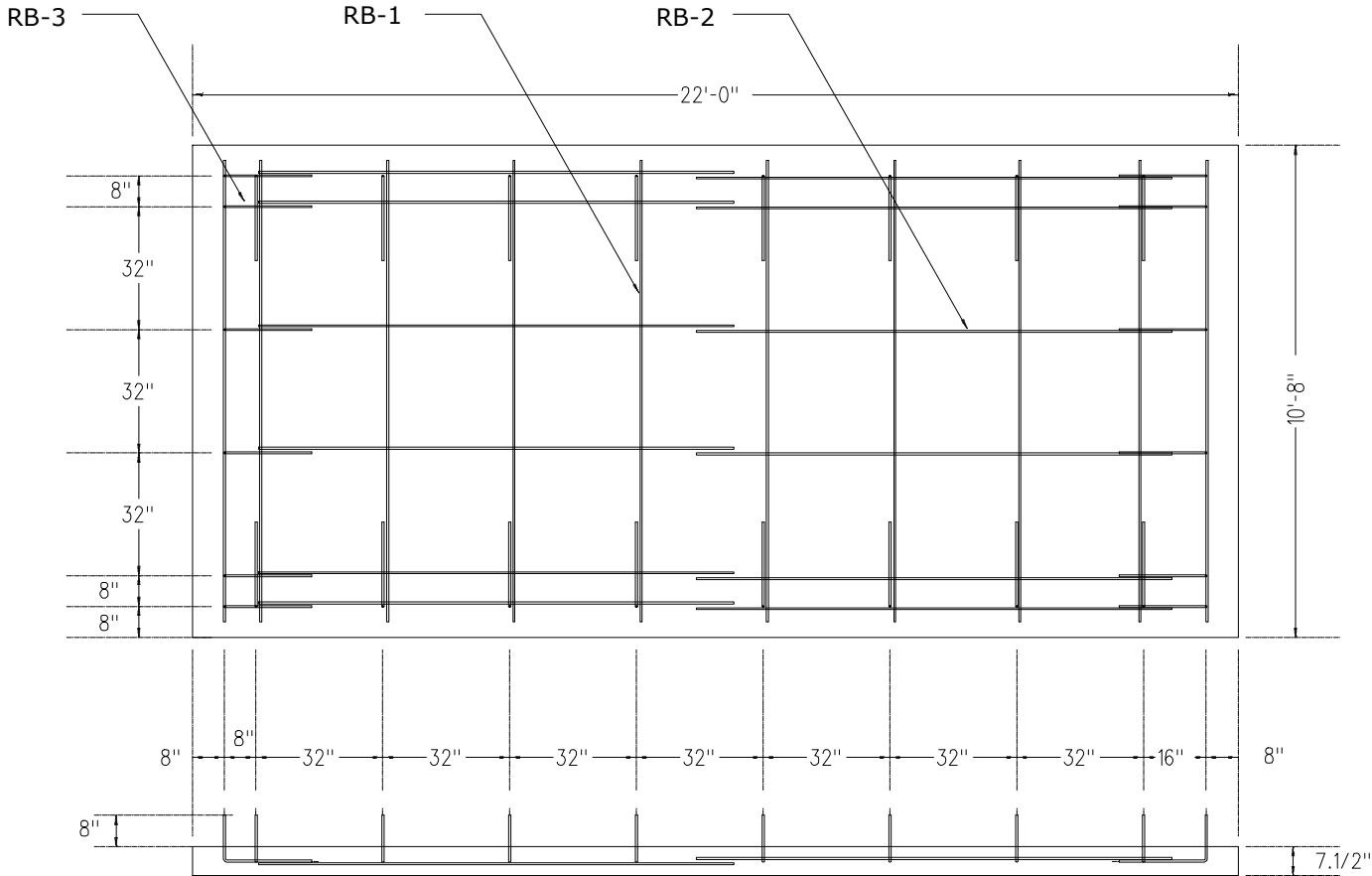


Figure G-6

Building the foundation — pouring the concrete

This section discusses concerns of both of the concrete pours.

Concrete ordering specification

Minimum 4,000 psi strength, 3/4-inch minus aggregate, and a 5-inch to 6-inch slump.

Pouring sequence

The concrete floor is poured finished and allowed several days curing time before commencement of the wall and ceiling construction. Then the walls and the are constructed, the ceiling trusses laid, the ceiling forms constructed, the riser assembly is constructed, and the second concrete pour is done.

Before ordering concrete

Make sure that the worksite is clean and free of obstacles and that sufficient space and workroom exists before ordering in equipment. Truck turnaround area may be a issue with some sites.

Round up when ordering concrete to ensure that you have enough to complete the fill.

Ensure that the concrete supplier is aware of the pour elevations of the shelter — the trucks that pour the concrete need to have the capability of accurately pouring concrete below ground level. The minimum depth that the concrete will be poured is 10 feet, 6 inches.

Minimum concrete quantities

Note quantities below are the minimum for the standard shelter design as described in this manual, if you have modified the shelter design be sure to modify your concrete requirement accordingly.

The standard block wall cavities and ceiling are poured as a single unit.

Each 10-foot section of 8-foot high wall will require 0.95 cubic yards of concrete. The total wall including the standard riser is approximately 70 linear feet, requiring 6.65 cubic yards of concrete.

The ceiling of 10-foot x 21.5-foot x .875-foot (10.1/2-inches) requires 6.9 cubic yards of concrete.

Total minimum concrete requirement is 13.6 cubic yards of **4,000 PSI high strength concrete**.

Floor: 5.5 cubic yards.

Walls and Ceiling: 13.6 cubic yards.

Total concrete: 19.1 cubic yards

See Section O — pouring the ceiling and walls before proceeding with this step. The two concrete pours become integral and both Section G and O should be read and read and understood before proceeding.

Constructing the walls — types of concrete blocks

There are 7 types of concrete blocks used in the wall and riser assembly. The bond bridge blocks have a channel cast into the top of them that allows a section of rebar to be bonded horizontally into the wall.

For complete dimensions of these parts, consult the *Detailed Parts Drawings Manual* available at: www.AmericanBombShelter.com

Figure H-1
Standard
concrete block

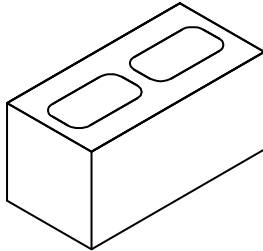


Figure H-4
Half bond
bridge block

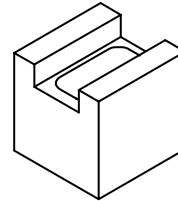


Figure H-2
Straight bond
bridge block

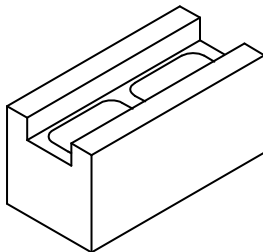


Figure H-5
Half end cap
bond bridge
block

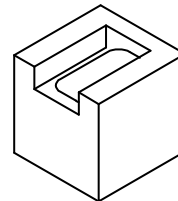


Figure H-3
Left hand
corner bond
bridge block

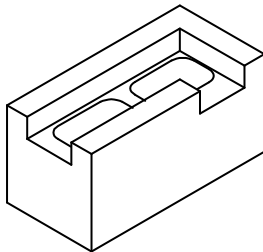


Figure H-6
Right hand
corner bond
bridge block

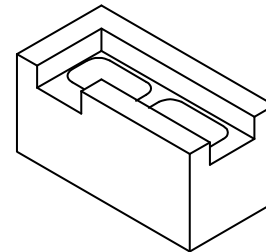


Figure H-8
Standard half
block

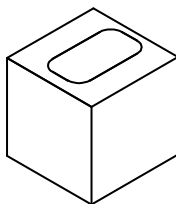
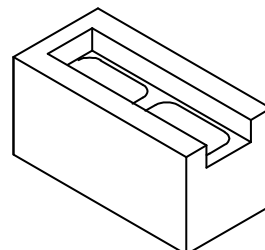


Figure H-7
End cap bond
bridge block



Standard concrete block 8-in x 8-in x 16-in.

Constructing the walls — the types of courses

A "course" is an industry term referring to a single layer of concrete blocks.

The wall assembly will consist of 11 courses of 45 blocks each for a total of 495 blocks.

Courses 1, 4, 7, and 10 are lateral bond courses using 8-inch x 8-inch x 16-inch bond bridge blocks and 1/2-inch (number-4) rebar — see figures H-2, H-3, H-4, H-5, H-6, H-7, and H-10. This gives a horizontal steel reinforcement on every third course.

Courses 2, 3, 5, 6, 8, 9, and 11 are standard 8-inch x 8-inch x 16-inch block — see figure H-1.

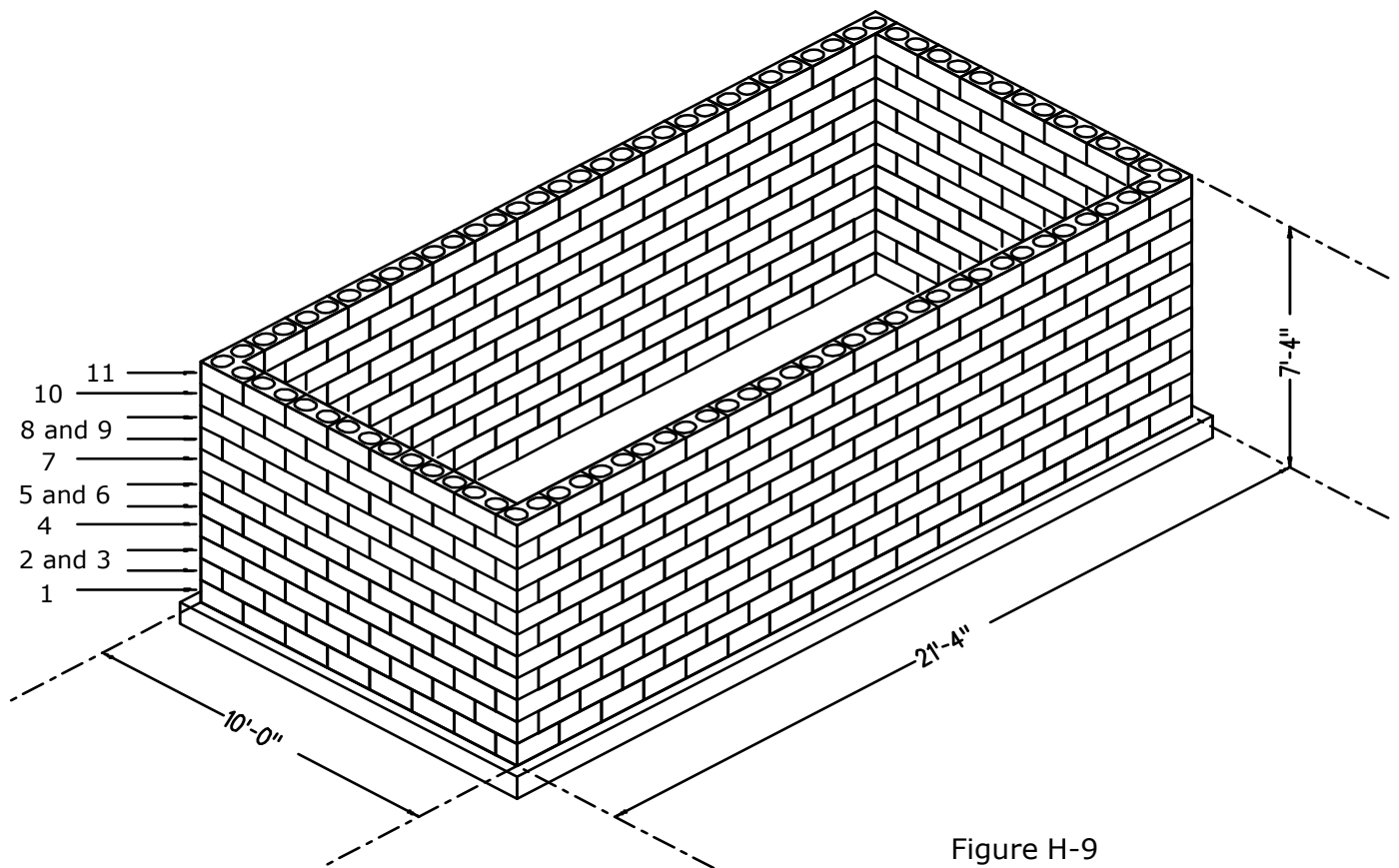


Figure H-9

Constructing the walls — horizontal rebar reinforcement

This page is an overview of a typical course that have the horizontal rebar reinforcement laid into a the bond bridge blocks.

The total 1/2-inch (number 4) rebar requirements for all four lateral bridge bond courses are:

- RB-4 corner bridge — 16 pieces, each 9.3/4 inches x 9.3/4 inches
- RB-5 end bridge — 8 pieces, 112 inches
- RB-6 side bridge — 16 pieces, 120 inches

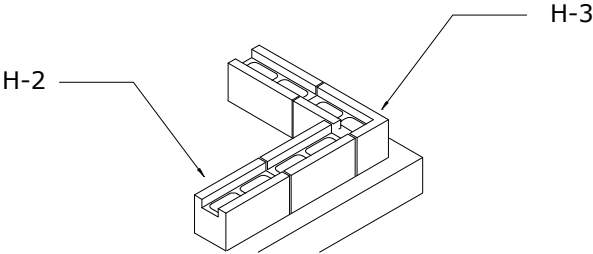
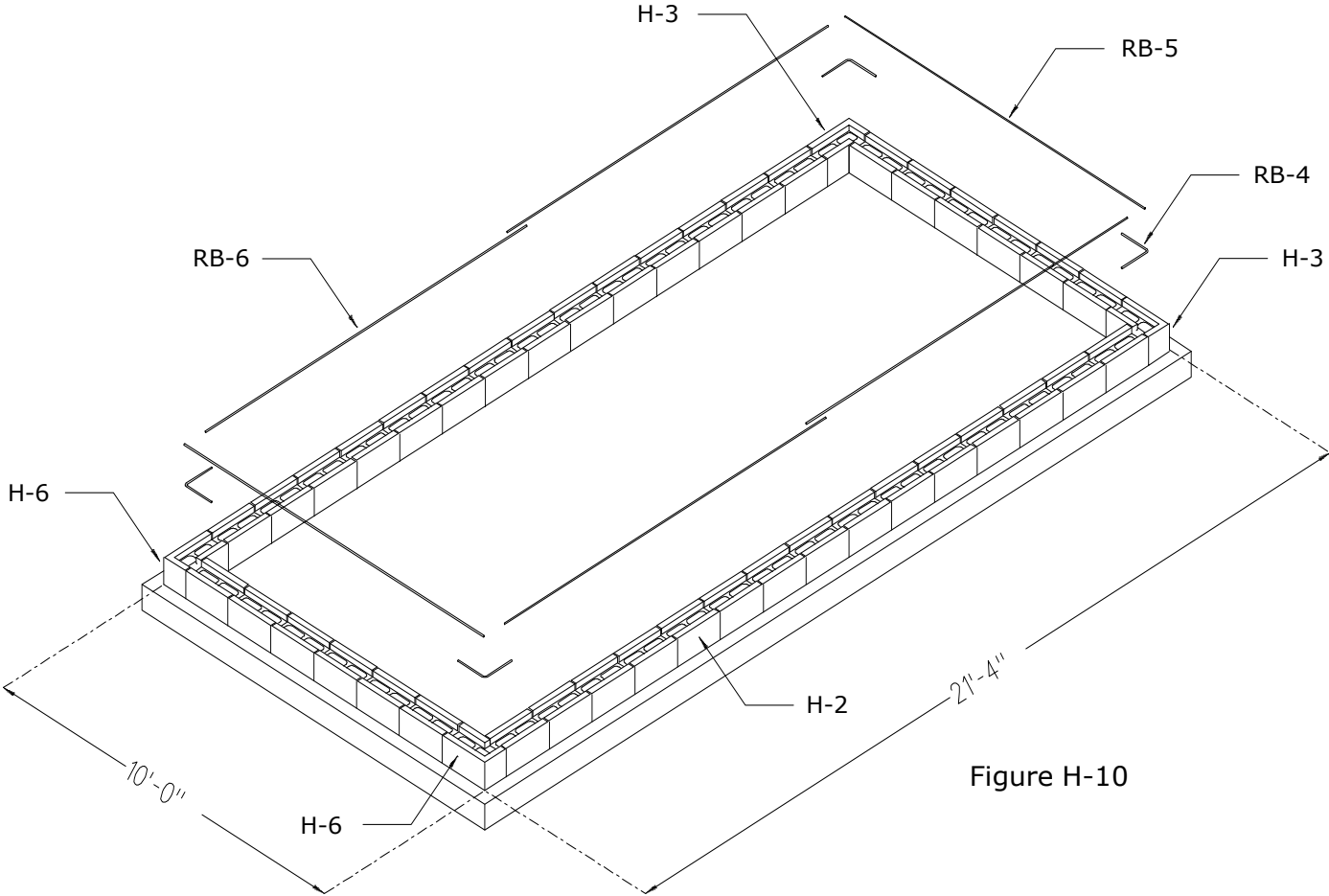


Figure H-11

Constructing the walls — preparation and laying a test run

Before starting to lay the blocks, drive stakes into the ground and build a form at each corner. These stakes and forms can be made from scrap pieces of wood used on the job — see figure G-9 below.

Locate the exact corner by stretching lines from one corner form to the other as illustrated. The exact corner will be the point at which the two lines cross.

Drop a plumb bob or laser down from each line, both at the corner point where the lines cross and at positions about 2-feet out in each direction.

Determine the exact number of blocks required for the first course by laying out a course of block on the dry concrete — see figure H-10. Do not use mortar for this test run — you are merely determining the number of blocks required for the job.

Be sure to use the corner blocks where needed, and cut blocks as required.

Use pieces of 3/8-inch plywood as a spacer to fill in the mortar joint between each block. This is the thickness of the mortar when applied.

Total mortar required for a 3/8-thick mortar bond is 37.1/2-cubic feet. Refer to the directions on the mortar packaging to determine the number of bags of mortar needed and the set time for the mortar.

After this test run, remove the blocks and prepare for the actual laying of the first course.

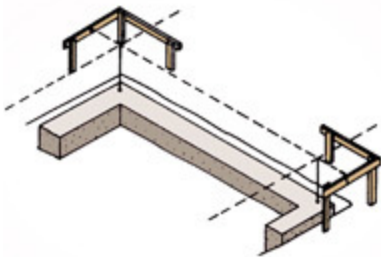


Figure H-12

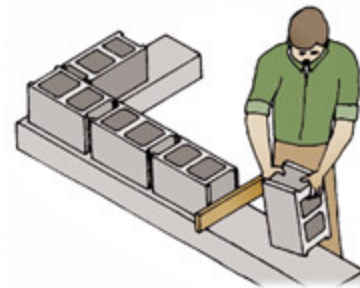


Figure H-13

Constructing the walls — laying the courses

Drop plumb bobs down from the corner string and at positions about 3' out from the corner. Mark the location of the corner block on the footing base.

Spread the mortar out about 1" deep and 8" wide in the marked area (see image). Extend this mortar out for a distance of about three or four blocks in one direction.

Put a furrow in the center of the mortar with a trowel. This furrow will force the mortar to the edge of the block when it is laid (see image).

Set the corner block first. Be sure you are using the correct block (finished end). Check the starting corner block, both horizontally and vertically, and take time to get it positioned correctly. All other blocks will align with this starter block, so it's very important to set it exactly. Follow this same procedure as you reach the other corners, laying the first course out about two or three blocks in each direction. Tie a line between two bricks and stretch it between the two corner blocks on the first course

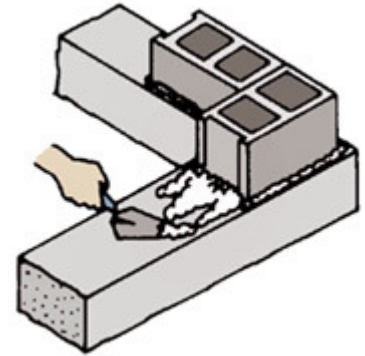


Figure H-14

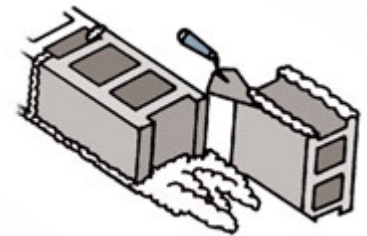


Figure H-15

Constructing the walls — critical points

Continue to lay the base mortar on the footing as the course continues. Apply mortar to the ends of the blocks with a trowel and place the block in position (see image above).

Keep all mortar joints at about $3/8$ ". If necessary to make spacing adjustments, fill some mortar joints $1/2$ " to $3/4$ ".

If you must cut a block to fill a course, use a masonry chisel as illustrated here. Draw a line on both sides of the block where the cut is to be made. Strike the chisel with a bricklayer's hammer. You will soon learn to make such cuts easily.

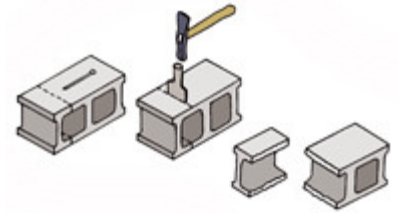


Figure H-16

After you've laid four or five blocks, use a long mason's level or some type of straightedge to check the alignment of the blocks (see image). Check both the tops of the blocks and the outside edge for correct alignment. Tap the blocks into position to make any alignment corrections while the mortar is still wet. Never attempt to move a block after the concrete begins to set. Build up the corners first. Always keep the corners about a block or two higher than other runs until you finish the job. Keep the guidelines between the corners at all times. They will help you keep the blocks level at all points in each course. Be careful not to knock the lines out of alignment.

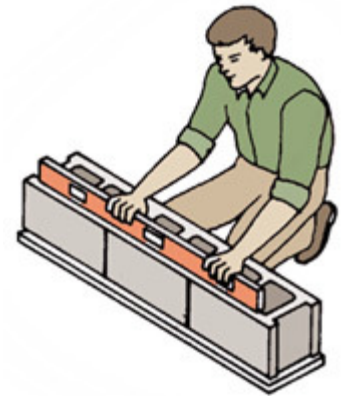


Figure H-17

Always keep the guidelines tight. If one side gets bumped out of position, take a minute to level it. Use a trowel to cut away any surplus mortar. Throw the surplus mortar back onto the mortarboard. Keep turning the mortar with your trowel throughout the project so small portions will not harden.

Constructing the walls — rebar reinforcement

Use a piece of 3/4" plywood or the bed of a wheelbarrow as a mortarboard. Always wet the board or the wheelbarrow bed before placing the mortar in it. Never mix more mortar than you can use in about an hour and a half or two hours. On a hot day, keep the mortar covered with a piece of plastic to hold in moisture. Use as much water as the mortar will take and still remain elastic. Continue to stagger the blocks—working from the corners—and build the wall to the desired height. Take time to level each course. Use a level that is at least 4-feet long. Lay all blocks with the thicker end of the face shell up. Keep a leveling string at the top of each course on each run of block. Measure both the length and the height of the wall after every two or three runs. Also, hold your level diagonally along the block corners to check for accuracy (see image). If the blocks are being laid accurately, the corners will strike evenly along a level held in this position.

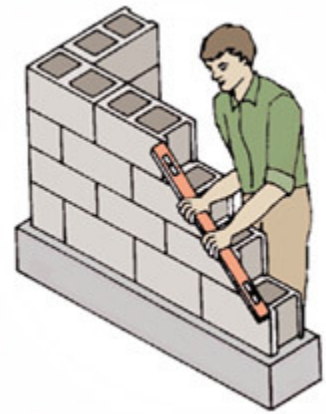


Figure H-18

After all the blocks are laid and while the mortar can still be pressed with the fingers, take a jointer and finish the mortar joints to the appearance desired. Keep the jointer wet during this part of the job.

You may need to add reinforcing rods to walls built extremely high or in areas where ground pressures may vary.

Lay 1/4-inch reinforcing rods as illustrated, with the ends overlapped 2-inches to 3-inches. Mortar can be placed directly over the rods.

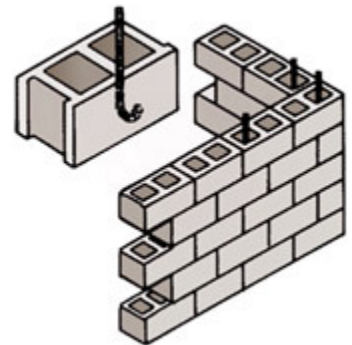


Figure H-19

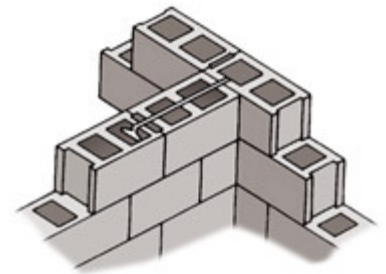


Figure H-20

Trusses — locations

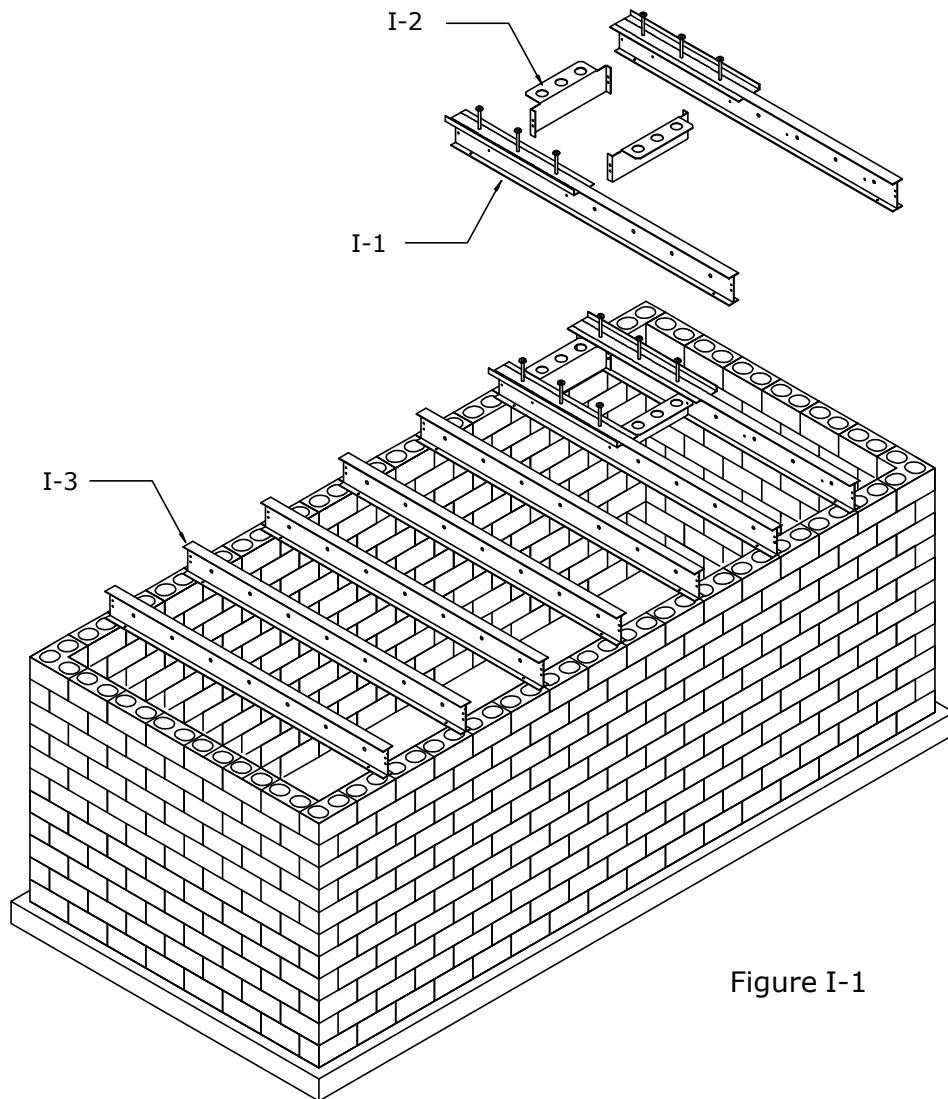


Figure I-1

Place center and assemble the riser truss pair (I-1) and the riser bearing plates (I-2) as per figure I-1, use the provided bolts located in the mounting holes of the riser trusses.

Place the remaining five standard trusses (I-3) as shown in figure I-1.

All trusses are centered on there longitudinal axis as shown

For complete dimensions of these parts,
consult the *Detailed Parts Drawings Manual* available at: www.AmericanBombShelter.com

Trusses — setting and centering

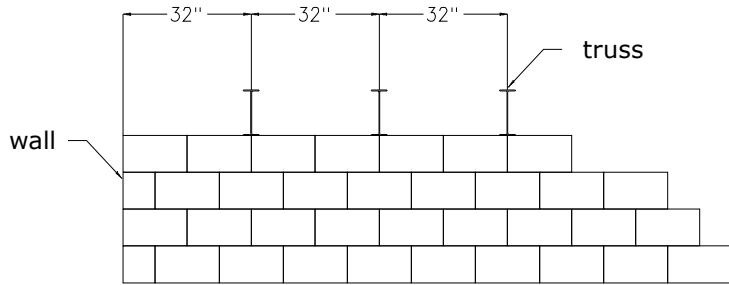


Figure I-2

Side (elevation) view — all trusses are located on 32" centers

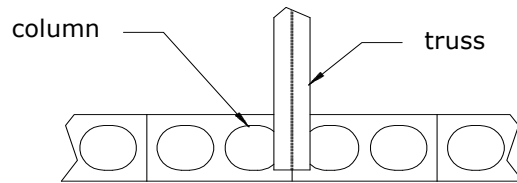


Figure I-3

Top (plan) view — all truss centers fall between the vertical columns in the block

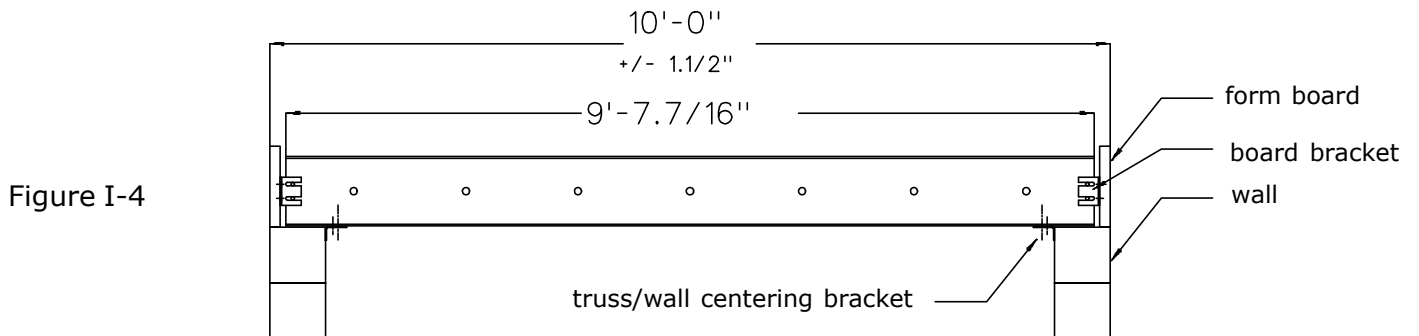


Figure I-4

End view — all trusses are centered on their long axis as shown above

For complete dimensions of these parts,
consult the *Detailed Parts Drawings Manual* available at: www.AmericanBombShelter.com

Ceiling form boards — installing the long perimeter form boards

There are three types of form boards used to form up the ceiling: the perimeter walls (long boards), perimeter ends (short boards), and the ceiling form boards (plywood).

The perimeter wall form boards serve two functions, first to secure the trusses from movement along the long axis of the shelter and secondly to provide the perimeter form for the poured concrete ceiling.

You will need the following for the perimeter forms of the ceiling:

2 each 2-inch x 12-inch x 12-foot long boards

2 each 2-inch x 12-inch x 10-foot long boards

CAUTION

It is critical that the distance between the truss centers on **both ends** of the trusses is correct as per figures I-4 and J-3.

Using the fasteners provided with your truss kit:

1. Install all board brackets to the ends of the centered trusses as shown in fig. I-4, and J-3 but do not yet tighten the board bracket securely to the truss.
2. Set the long form boards on top of the wall and against the face of the board brackets as shown in figure J-3.
3. Using the board brackets as a template, mark and drill the 3/8-inch holes for the perimeter long form board bolts, and fasten the long form boards to the brackets.
4. Adjust the long perimeter form boards so that the outside face of the board is flush with the outside face of the wall, and tighten the board bracket truss bolts, as per figure J-3.

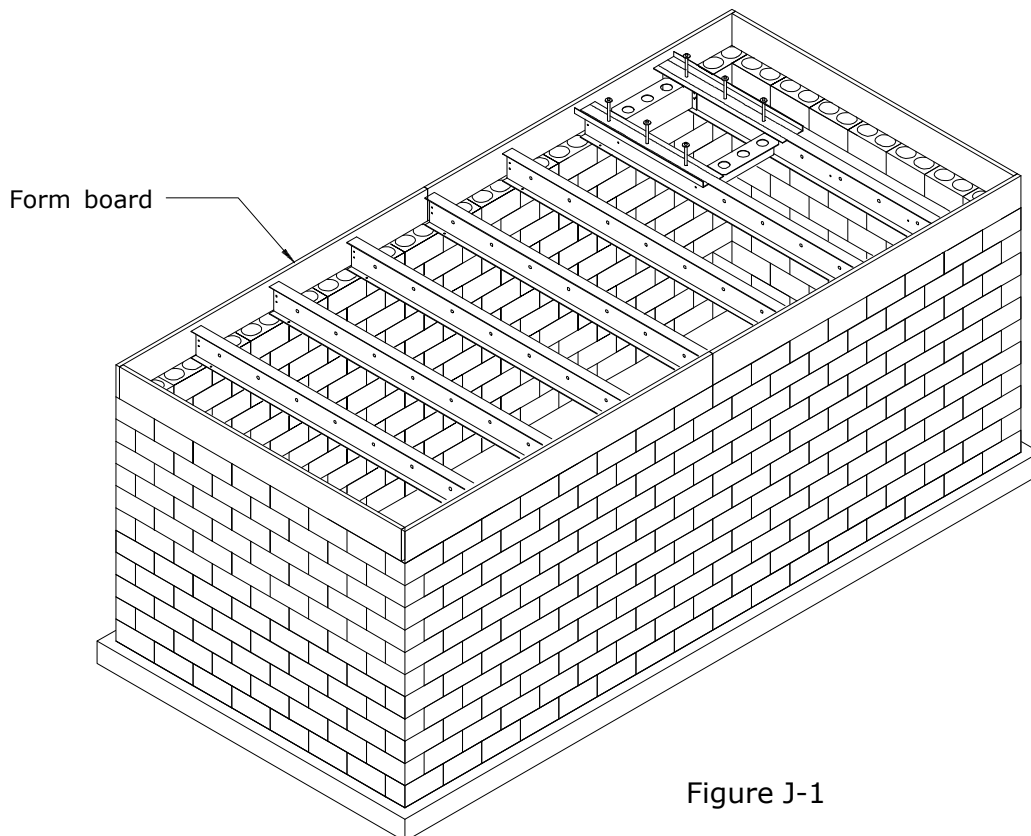


Figure J-1

Ceiling form boards — installing the short perimeter form boards

1. Install the two short form boards over the end walls with the outside face of the board flush with the outside face of the wall just as the long form boards.
2. Use the corner board brackets as a drill template and fasten the corners with the provided bolts.

**For detailed angle bracket dimensions consult the detailed
*Parts Drawings Manual***

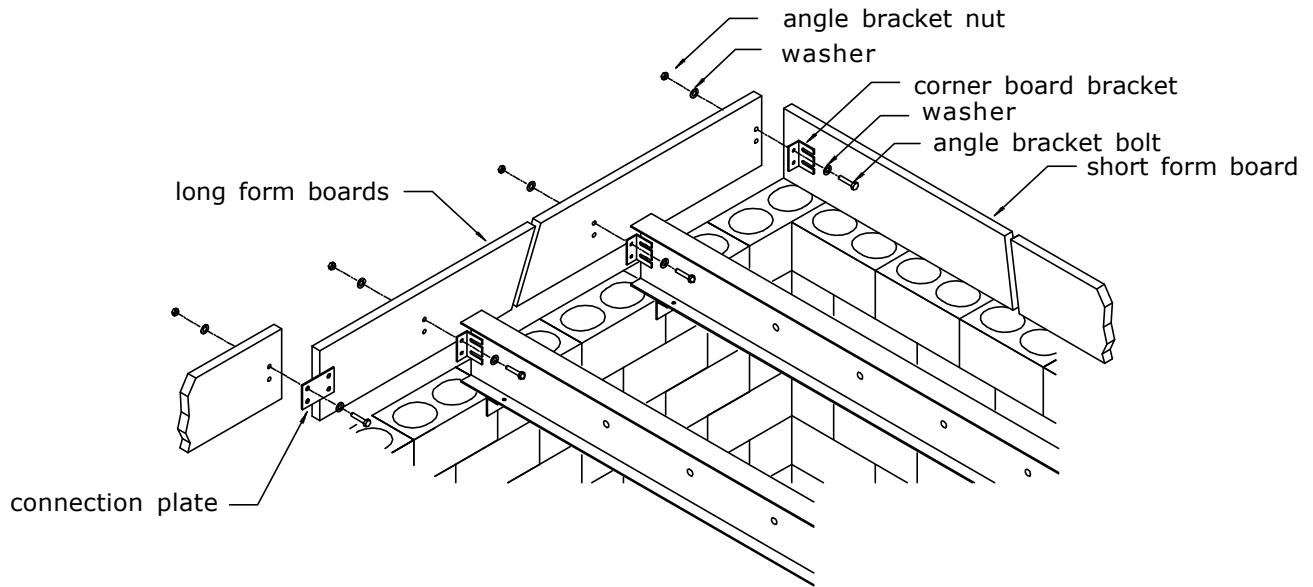


Figure J-2

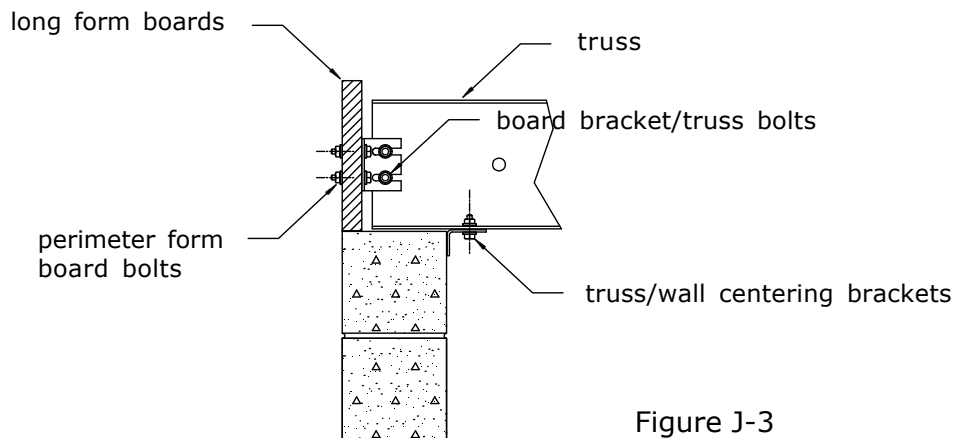


Figure J-3

Ceiling form boards — bottom form board locations

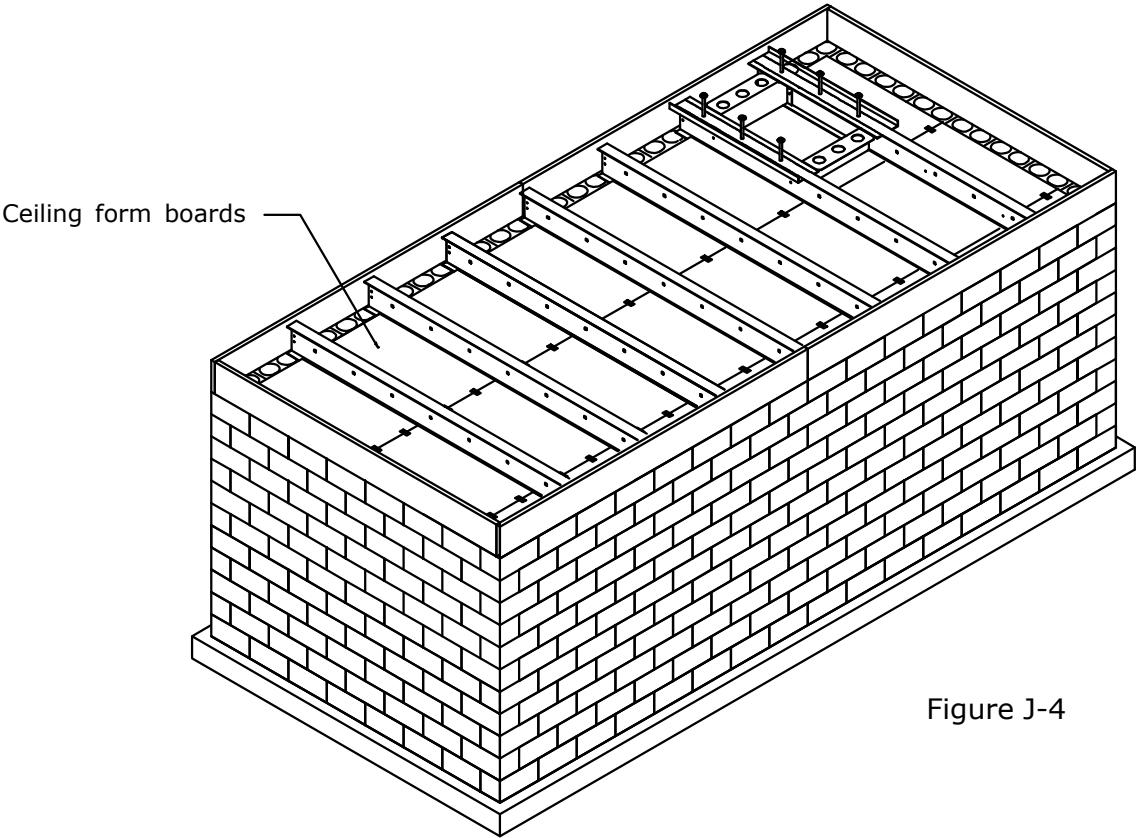
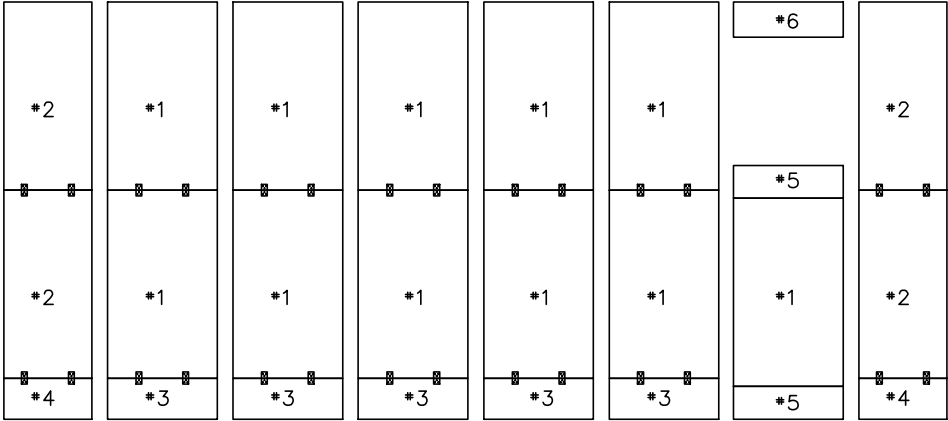


Figure J-4



Ceiling form board location chart
 See figure J-6 and J-7 for
 installation and cutting guide

Figure J-5

For complete dimensions of these parts,
 consult the *Detailed Parts Drawings Manual* available at:
www.AmericanBombShelter.com

Ceiling form boards — bottom form board installation

The bottom form boards are constructed from 1.125 (one and an eighth inches) CDX plywood. It is individually cut into 25 pieces of exact size to nest between the truss beams while at the same time being captured by the bottom flange of the beams.

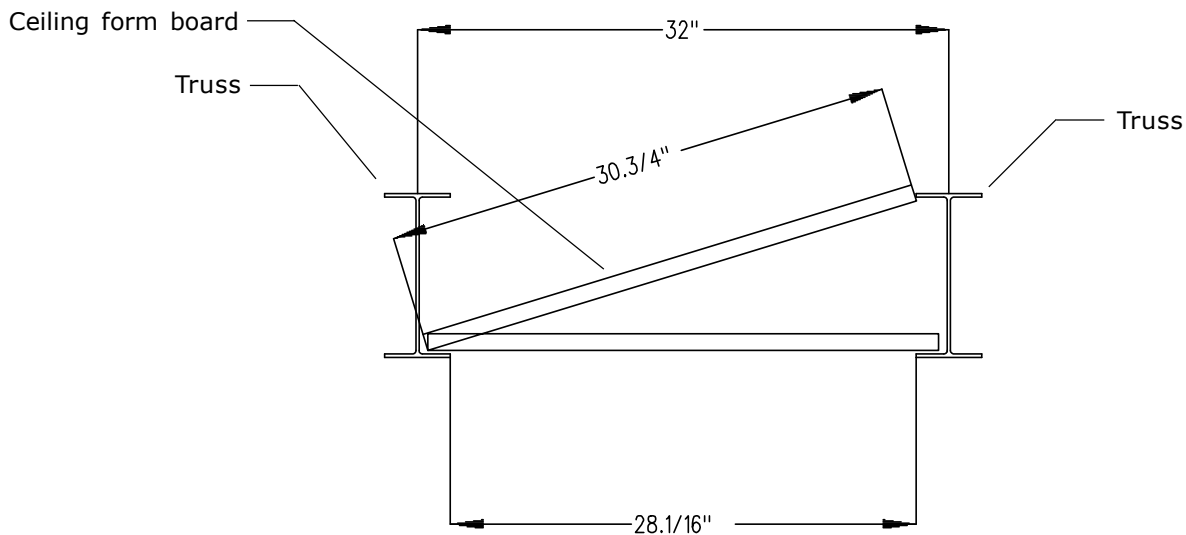
The finished cut pieces are rotated into place from the top side of the trusses — see below.

See fig. J-5 for location map and fig. J-7 for material and cutting schedule. You will need 6-sheets of 4-feet x 8-feet x 1-inch CDX plywood.

CAUTION

The true truss center dimensions may vary. Measure all cutting dimensions against the actual truss center dimensions before cutting — be sure to measure **both ends** of the truss as the trusses **may not** be exactly parallel.

For ease in assembly and a secure fit the cut material should always be $2.5/8$ -inches to $2.11/16$ -inches wider than the **inside** flange distance.



Rotating installation technique

Figure J-6

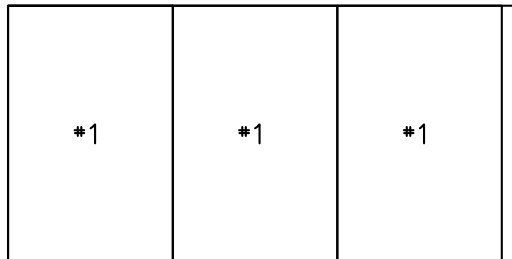
Ceiling form boards — cutting them out of the plywood panels

Cutting schedule for the bottom plywood form sections. All panels are 1.125-inch CDX plywood.

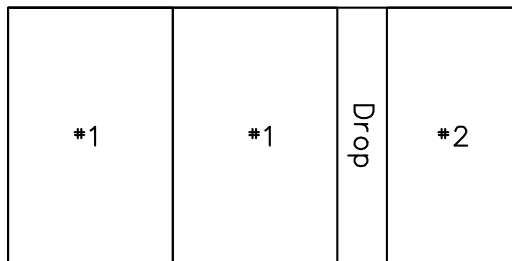
CAUTION

Because these panels will hold the uncured (wet) concrete until it cures (hardens) it is strongly recommended that no substitutions be made for the specified material — if these panels fail, you will literally have tons of wet, curing (soon to be hard) concrete sitting on the floor of your shelter.

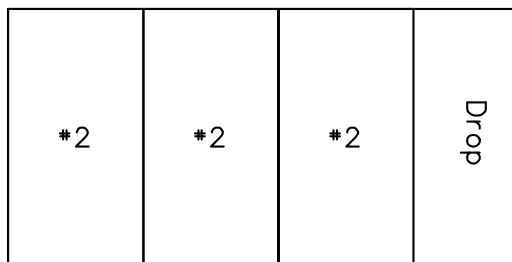
3 sheets required



1 sheet required



1 sheet required



1 sheet required

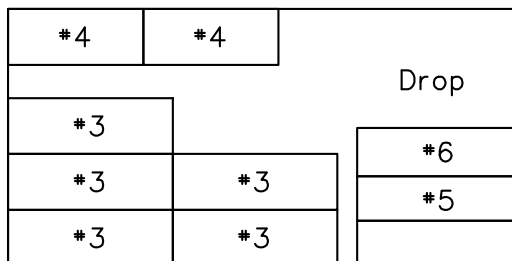


Figure J-7

For complete dimensions of these parts, consult the *Detailed Parts Drawings Manual* available at: www.AmericanBombShelter.com

Ventilation system — description

The shelter ventilation system is in an easy to install kit form and addresses all four of the critical requirements below.

1. Sufficient air supply for the number of sheltered occupants
2. A proper filtration system to insure scrubbing of nuclear, biological, and chemical contaminants.
3. Explosion resistant blast valves over the intake and exhaust ventilation ducts to protect both the filtration equipment and the occupants from high pressure blast waves.
4. A regulating overpressure valve over the exhaust blast valve to insure a positive air pressure inside the shelter is maintained, as well as a regulated outflow to insure true air throughput.

CAUTION

The ventilation pipes are poured in place. They must be positioned before the concrete pour of the ceiling.

The ASR-100N-NBC and ASR-48-NBC Safe Cell filtration units not only provide excellent protection from an NBC event, but can also be purchased with an optional manual hand pump and an automatic battery backup system in case of electrical line failure. See the appropriate manual for the installation and operation of these filters.

Ventilation system ducts — overview

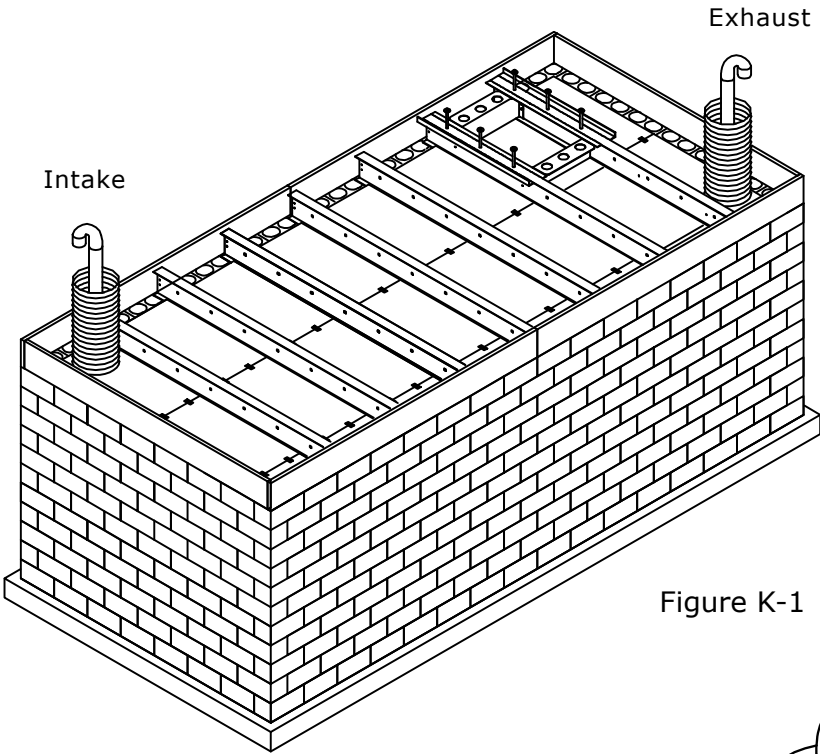


Figure K-1

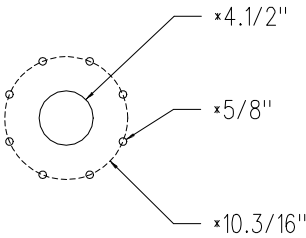


Figure K-2
Mounting bolt
pattern and
dimensions

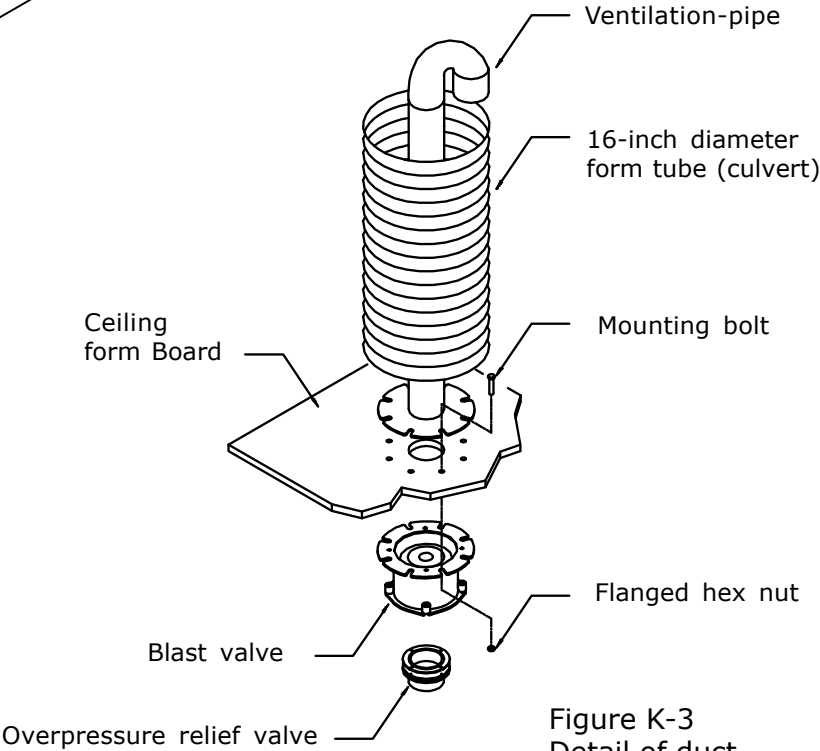


Figure K-3
Detail of duct
system

Ventilation system — installing the intake and outflow ducts

Note figure K-4 and K-5 below are for reference only and show the ventilation duct and blast valve assembly as they will appear after the concrete has been poured.

Install the ventilation ducts through the ceiling at opposite corners as shown figure K-1.

Cut or drill a 4.1/2-inch diameter center hole and 10 each 5/8-inch diameter bolt holes on a 10.3/3-inch hole circle in the ceiling form board — use the blast valve or ventilation pipe base as a template, see figure K-2.

Assemble the components, sandwiching the ceiling form board as shown in figure K-3

Note that only the exhaust vent blast valve has an overpressure relief valve fitted, figure K-5

For complete dimensions of these parts, consult the *Detailed Parts Drawings Manual* available at: www.AmericanBombShelter.com

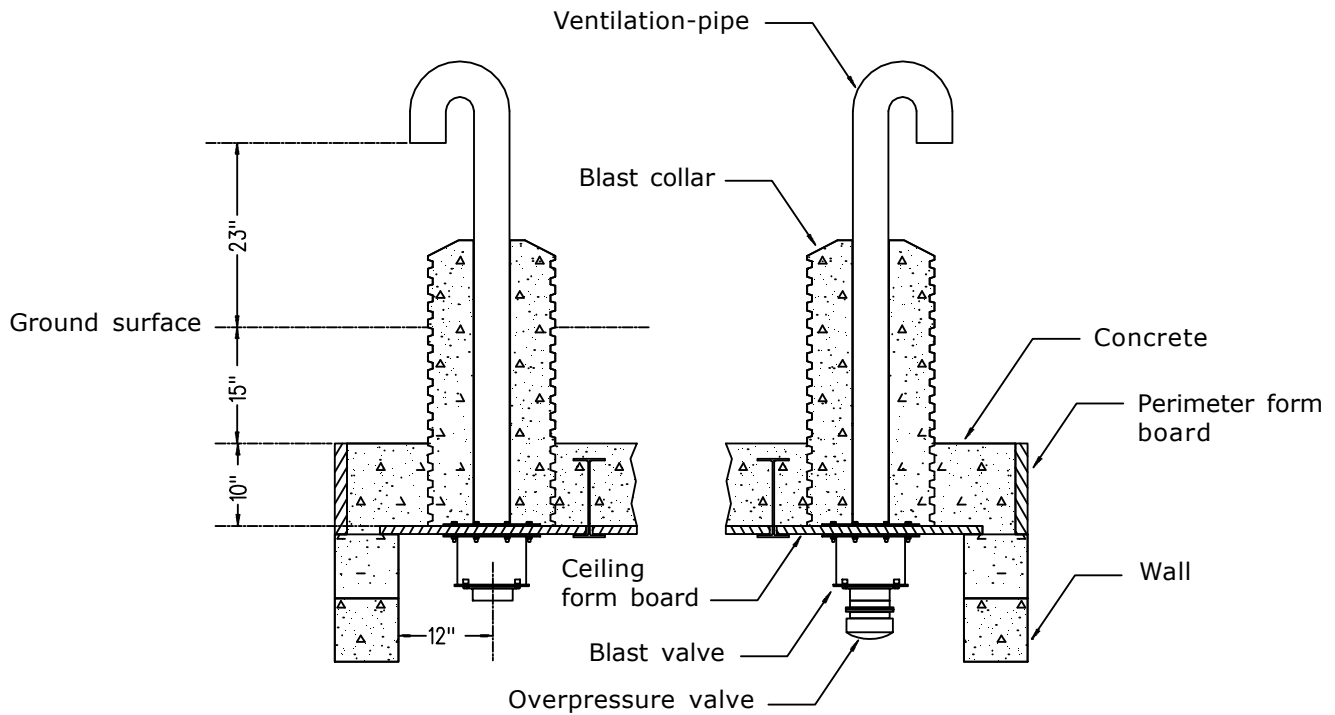


Figure K-4
Intake detail

Figure K-5
Exhaust detail

Riser structure — overview

The riser is the ingress and egress (enter and exit) point for the shelter. It is critical that the riser be constructed as per this manual to ensure its integrity.

CAUTION

The riser structure(s) **must** be placed on top of the bearing plates and on the edge of the ceiling.

You can easily install two of these risers (for redundancy) by duplicating the instructions in this section. Be sure and specify if you wish to do this at time of ordering. There will be an extra charge for the additional bearing plates and the rebar necessary for the extra riser.

There are two different versions of the riser structure, each of which may be modified to suit the end user shown below. The short riser allows the shelter to be placed at ground level — if you wanted to build a structure like a shed or a house on top of it. The tall riser allows the hole to be backfilled with three feet of earth — if you wanted the protection of the mass of that earth to stop radiation.

L-1 Short single riser or blast hatch only

L-2 Tall single riser with blast door and blast hatch, shown here

Use the same construction technique for the riser structure as was used construction the wall assembly.

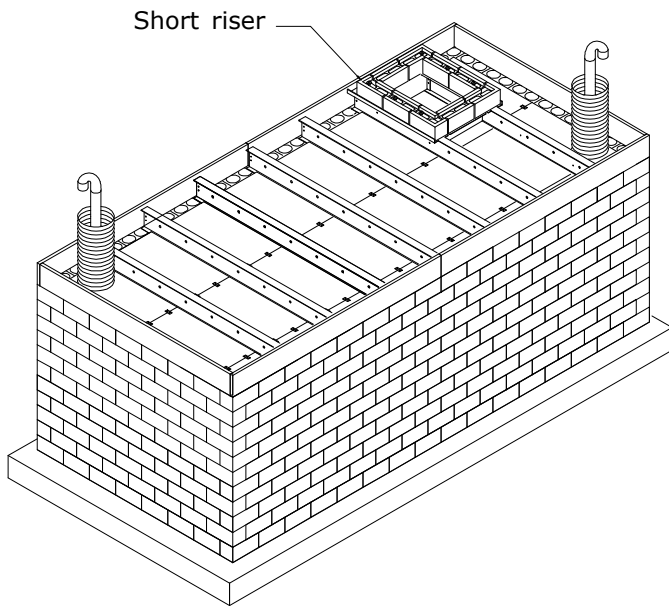


Figure L-1

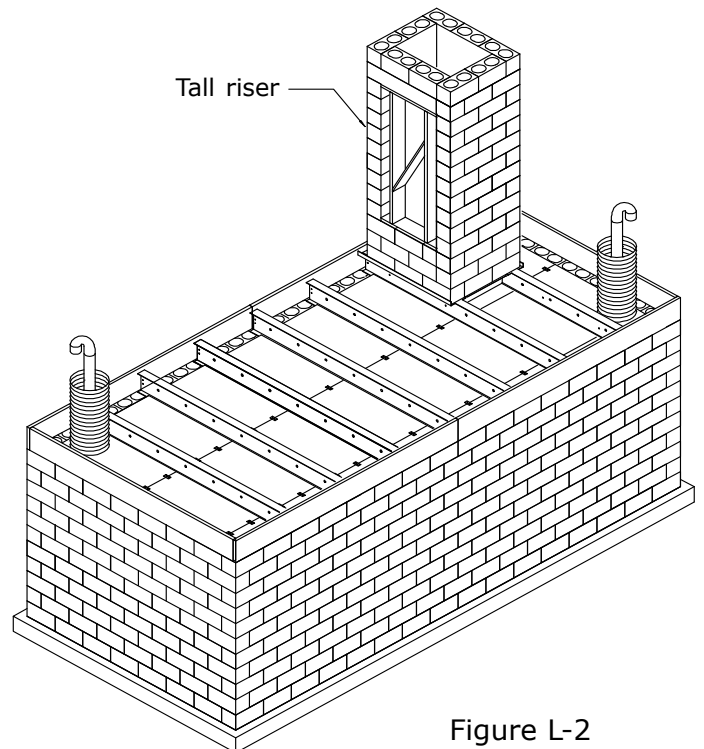


Figure L-2

Riser structure — block lay-up overview text

Courses 1, 4, 7, 10, and 13 all except a horizontal rebar and use a horizontally gunelled block that is typically referred to as “bond bridge block.”

The block requirement for the single short riser or one course of block is 9 pieces:

L-2..... 5 each — straight bond bridge block
L-3..... 2 each — left hand corner bond block
L-6..... 2 each — right hand corner bond bridge block

The block requirement for the single high riser or fourteen courses of block is 110 pieces:

L-1..... 66 each — standard block
L-2..... 19 each — straight bond bridge block
L-3..... 7 each — left hand corner bond block
L-4..... 0 each — half bond bridge block
L-5..... 2 each — half cap bond bridge block
L-6..... 6 each — right hand corner bond bridge block
L-7..... 4 each — cap bond bridge block
L-8..... 6 each — standard half block

For block placement guidance use the block lay-up map figure H-5.

Rebar installation

For added strength a horizontal run of 1/2-inch (number 4) rebar is installed in block courses 1, 4, 7, 10, and 13.

Figure L-5 shows the rebar installation detail for bond bridge courses one and thirteen only.

RB-12 4 each — corner bond
RB-13 2 each — short bond
RB-14 2 each — long bond

Bond bridge courses four through ten listed below.

RB-12 2 each — corner bond
RB-13 2 each — short bond
RB-14 1 each — long bond

See the Section M (rebar) of this manual for more details.

Riser Structure — block lay-up overview figures

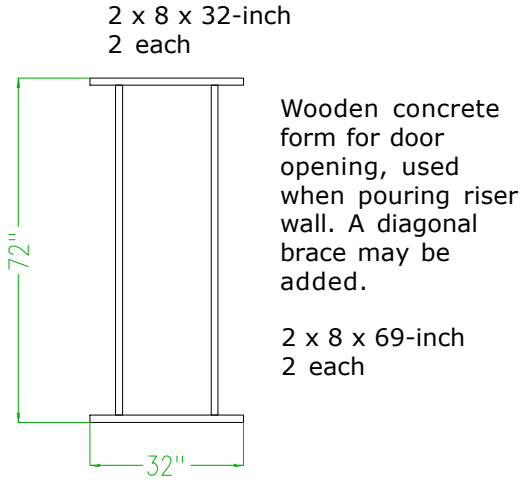


Figure L-3

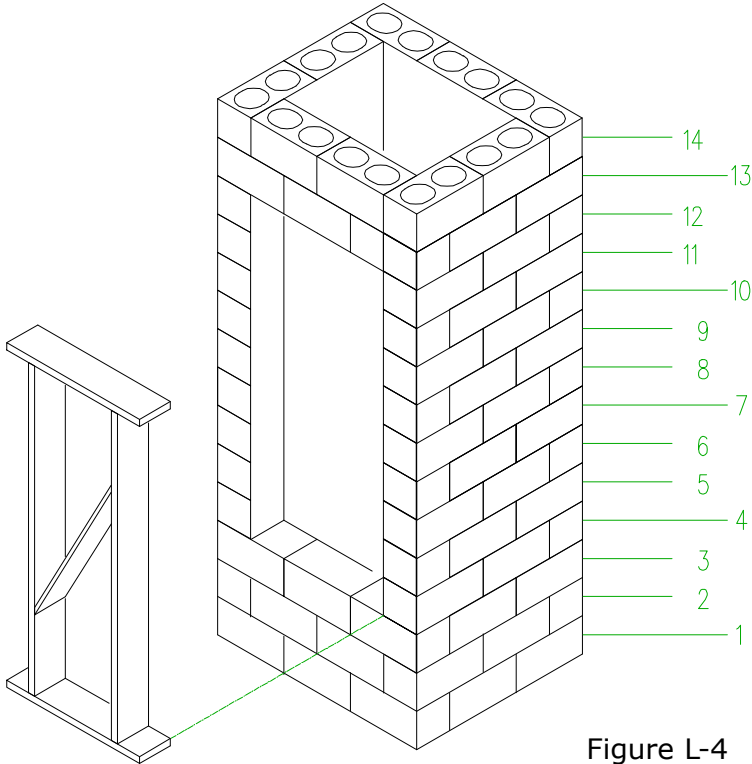
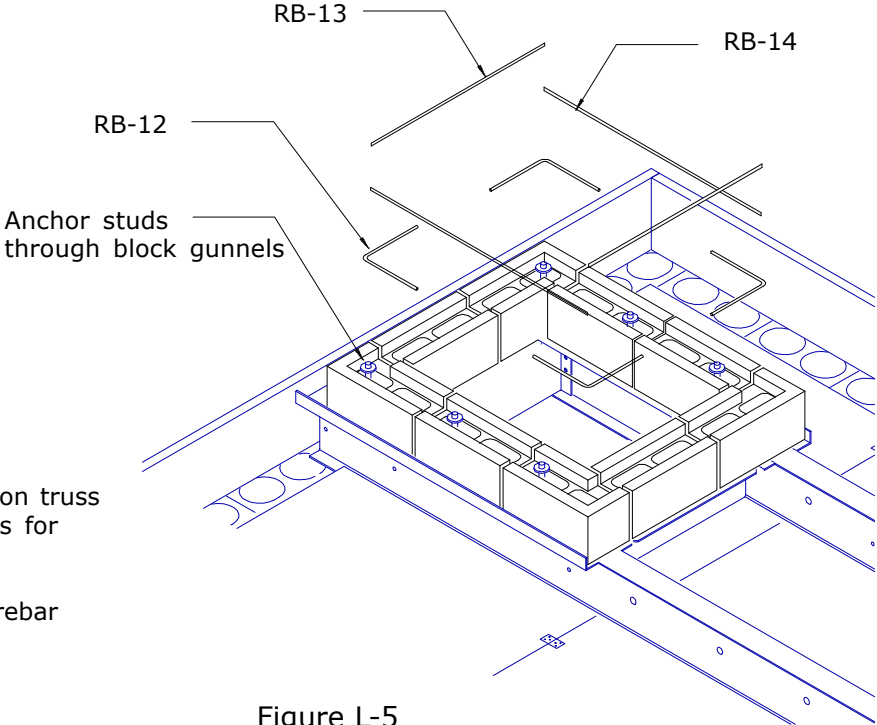


Figure L-4



Starting block lay-up on truss set and bearing plates for single riser structure.

Base bond row with rebar locations as shown.

Figure L-5

Riser Structure — block lay-up course maps

There are 12 courses in the typical riser. The course number is in the center of every illustration below.

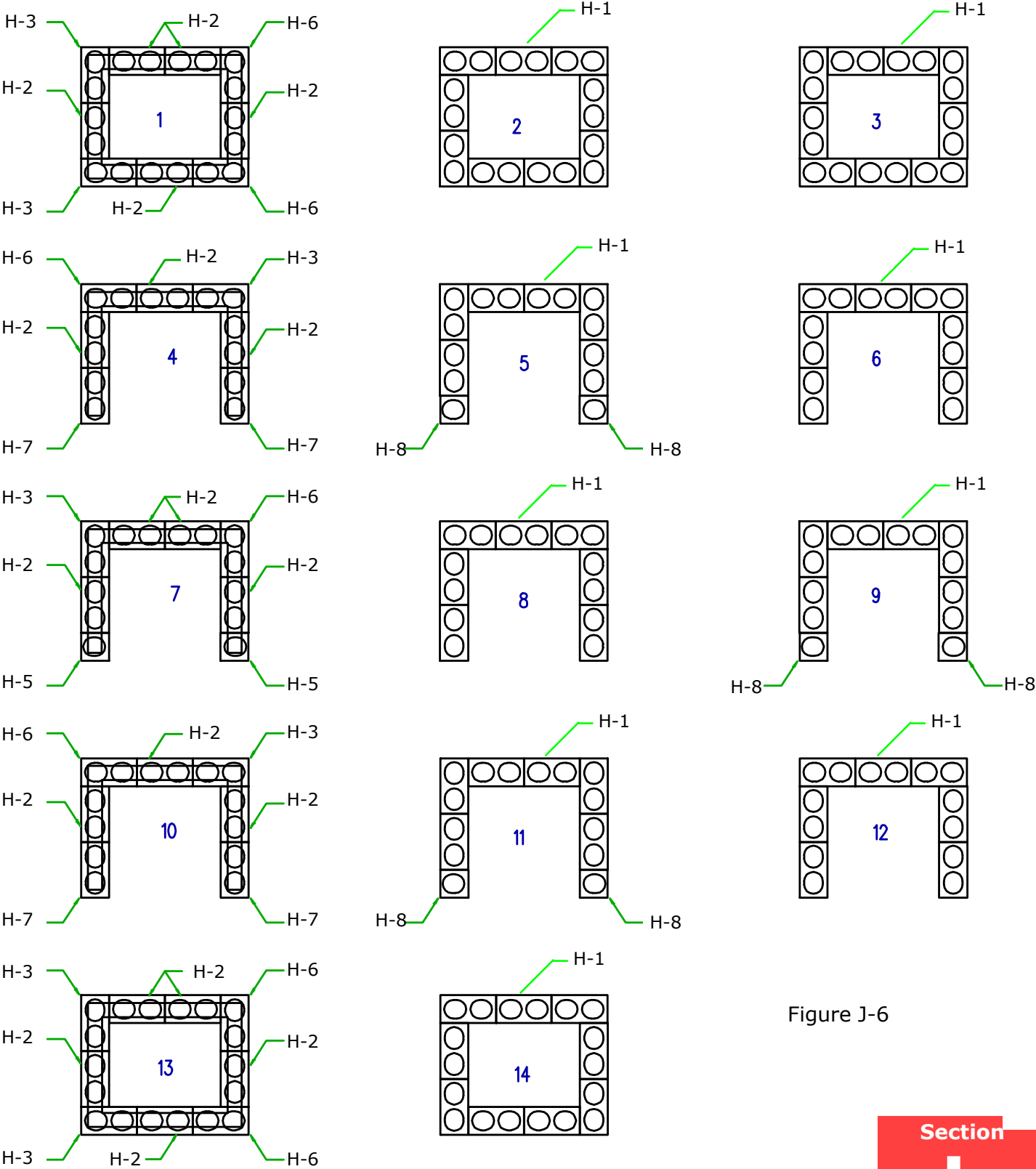


Figure J-6

Rebar — naming conventions

All of the rebar used in this kit is 1/2-inch (number 4).

All of the rebar must be laid (positioned) in place **before** the concrete is poured over it.

A “**run**” is a length of rebar.

All of the rebar is one or more of the following:

Corner reinforcement — laid into a corner joint, either horizontally or vertically

Vertical — oriented straight up and down

Horizontal — oriented parallel with the ground — see below:

All of the **horizontal** rebar is referred to as either:

Length — the long length of the shelter (sides)

Width — the short length of the shelter (ends)

All of the rebar is one or more of the following:

Slab reinforcement — laid into the foundation (floor) or ceiling

Wall bond — used to reinforce the blocks that make up the walls

A combination of the slab reinforcements and wall bonds that reinforce the slabs to the walls

Some, but not all of the longer pieces have the corner reinforcement built into them. They are referred to as either a **long bend**, a **short bend** or a **z-bar**.

The vertical reinforcements are referred to as **short, medium, or long runs**.

In order to facilitate fabrication and shipment, a commercial rebar splinting system is used for the reinforcement necessary for the length runs. That system is covered later in this section.

Rebar dimensions — foundation reinforcement

Figure M-1



Part numbers: RB-1 and RB-2
1/2-inch (#4 Rebar)
22 pieces
Slab width run and length run

Figure M-2



Part number: RB-3
#4 Rebar
30 pieces
Corner reinforcement

For complete dimensions of these parts,
consult the *Detailed Parts Drawings Manual* available at:
www.AmericanBombShelter.com

Rebar dimensions — horizontal wall reinforcement

For complete dimensions of these parts,
consult the *Detailed Parts Drawings Manual* available at: www.AmericanBombShelter.com

Figure M-3



Part number: RB-4
1/2-inch (#4 rebar)
16 pieces
Corner bond

Figure M-4



Part number: RB-5
1/2-inch (#4 rebar)
8 pieces
Bond width run

Figure M-5



Part number: RB-6
1/2-inch (#4 rebar)
16 pieces
Bond length run

Rebar dimensions — ceiling reinforcement

Figure M-6



Part number: RB-7
1/2-inch (#4 rebar)
40 pieces
Vertical — long bend
Ceiling slab and wall

Figure M-7



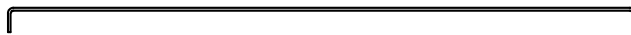
Part number: RB-8
1/2-inch (#4 rebar)
2 pieces
Vertical — short bend
Ceiling slab and wall

Figure M-8



Part number: RB-9 (Z-bar)
1/2-inch (#4 rebar)
2 pieces
Ceiling slab and wall

Figure M-9



Part number: RB-10
1/2-inch (#4 rebar)
12 pieces
Horizontal — width run
Ceiling slab and wall

Figure M-10



Part number: RB-11
1/2-inch (#4 rebar)
14 pieces
Horizontal — length run
Ceiling slab and wall

For complete dimensions of these parts,
consult the *Detailed Parts Drawings Manual* available at:
www.AmericanBombShelter.com

Rebar dimensions — riser reinforcement

Figure M-11



Part number: RB-12
1/2-inch (#4 rebar)
20 pieces
Horizontal — corner bond

Figure M-12



Part number: RB-13
1/2-inch (#4 rebar)
20 pieces
Horizontal — short bond

Figure M-13



Part number: RB-14
1/2-inch (#4 rebar)
7 pieces
Horizontal — Long bond

Figure M-14



Part number: RB-15
1/2-inch (#4 rebar)
14 pieces
Vertical — long run

Figure M-15



Part number: RB-16
1/2-inch (#4 rebar)
4 pieces
Vertical — short run

Figure M-16



Part number: RB-17
1/2-inch (#4 rebar)
4 pieces
Vertical — medium run

For complete dimensions of these parts,
consult the *Detailed Parts Drawings Manual* available at:
www.AmericanBombShelter.com

Rebar splinting — perpendicular installation

Use this page as a guide when connecting two pieces of rebar that are laid perpendicular (square) to each other. Where the two pieces of rebar come together is referred to as an "intersection."

- 01.** Face the overlying rebar section so it is parallel to your shoulders. Grasp the clip at the end of the long arm and hold it so that the spring loop faces up.

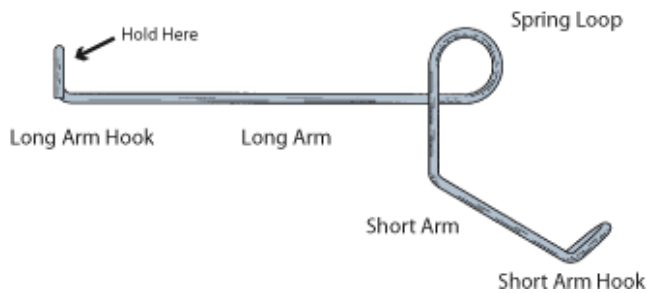


Figure M-17

- 02.** Place the short arm hook under the underlying rebar section about 1/2" below the rebar intersection.

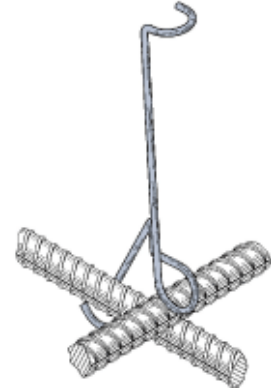


Figure M-18

- 03.** Position the spring loop over the overlying rebar section and to the right side of the underlying rebar.

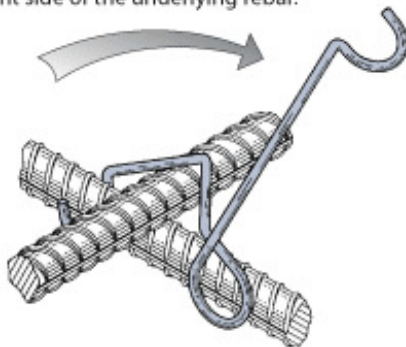


Figure M-19

- 04.** Push the long arm hook down and position under the underlying rebar section and release. The connection has been made!

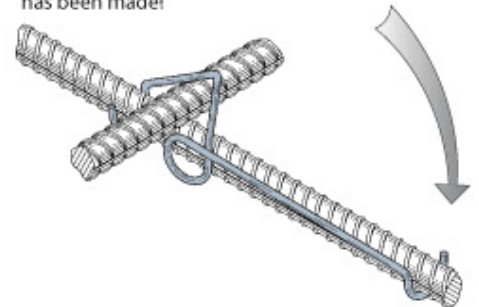


Figure M-20

Rebar splinting — parallel installation

Use this page as a guide when connecting two pieces of rebar that are laid parallel to each other. Where the two pieces of rebar come together is referred to as a "splint."

- 01.** Face the overlying rebar section so it is parallel to your shoulders. Grasp the clip at the end of the long arm and hold it so that the spring loop faces up.

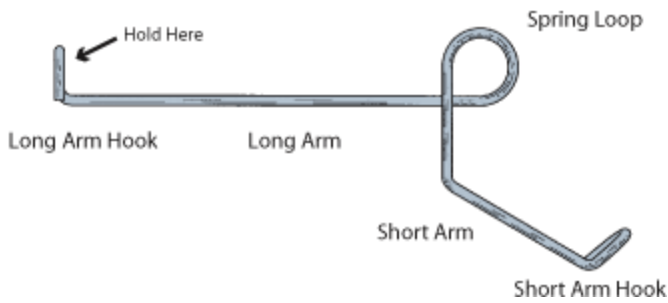


Figure M-21

- 02.** Place the short arm hook under the underlying rebar section.

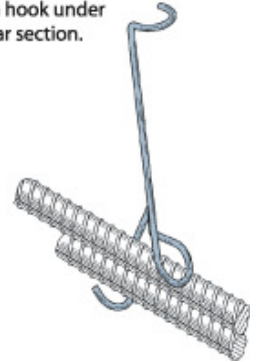


Figure M-22

- 03.** Position the spring loop over and past the right side of both rebar.

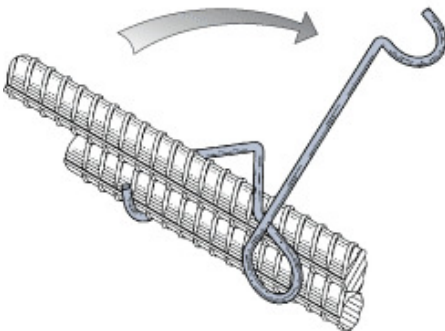


Figure M-23

- 04.** Push the long arm hook down and position under the underlying rebar section and release. The connection has been made!

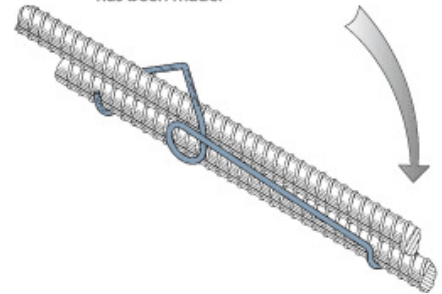


Figure M-24

Rebar installation — wall and ceiling

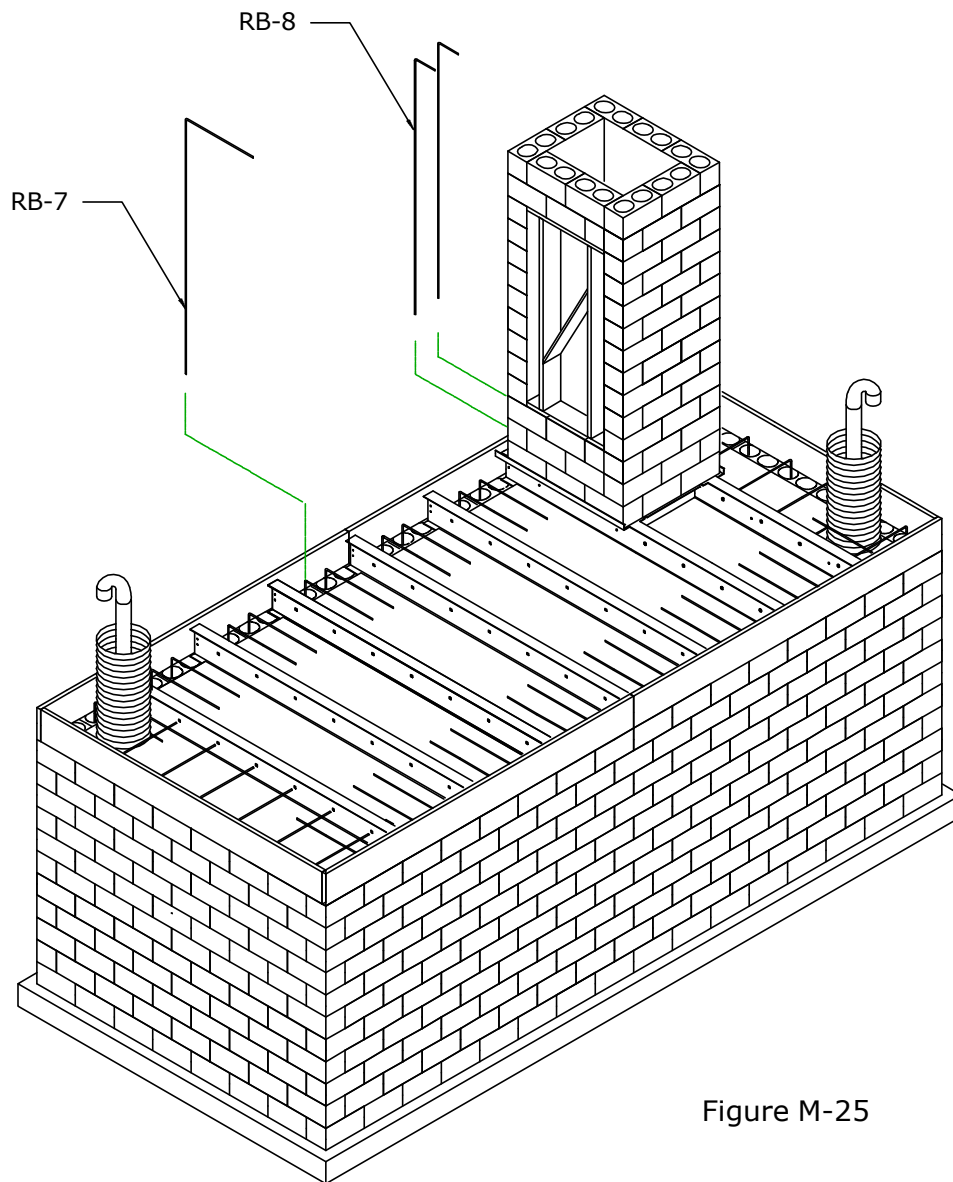


Figure M-25

RB-7 40 pieces: 91.3/4-inches x 27.3/4-inches
RB-8 2 pieces: 91.3/4-inches x 8-inches

Rebar installation — wall and ceiling

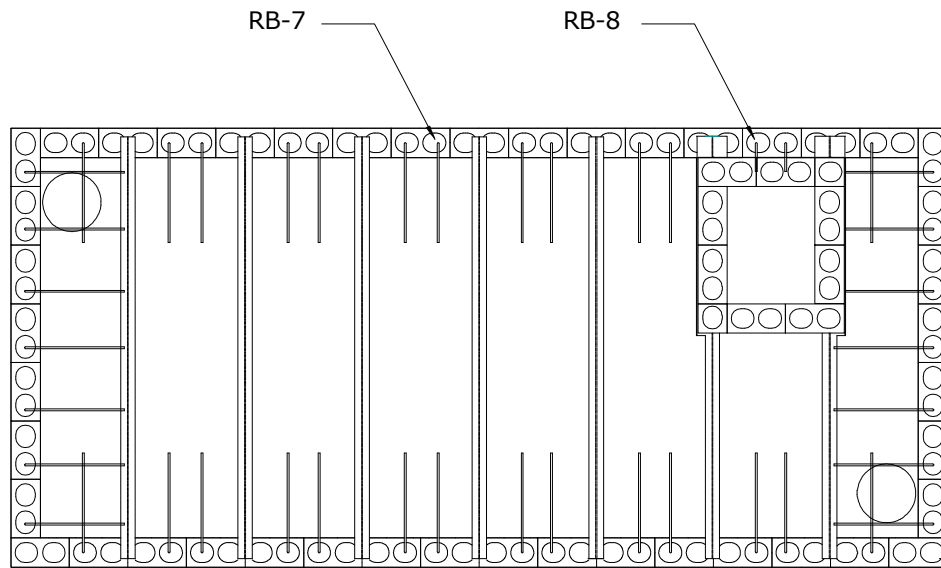


Figure M-26

Rebar installation — ceiling

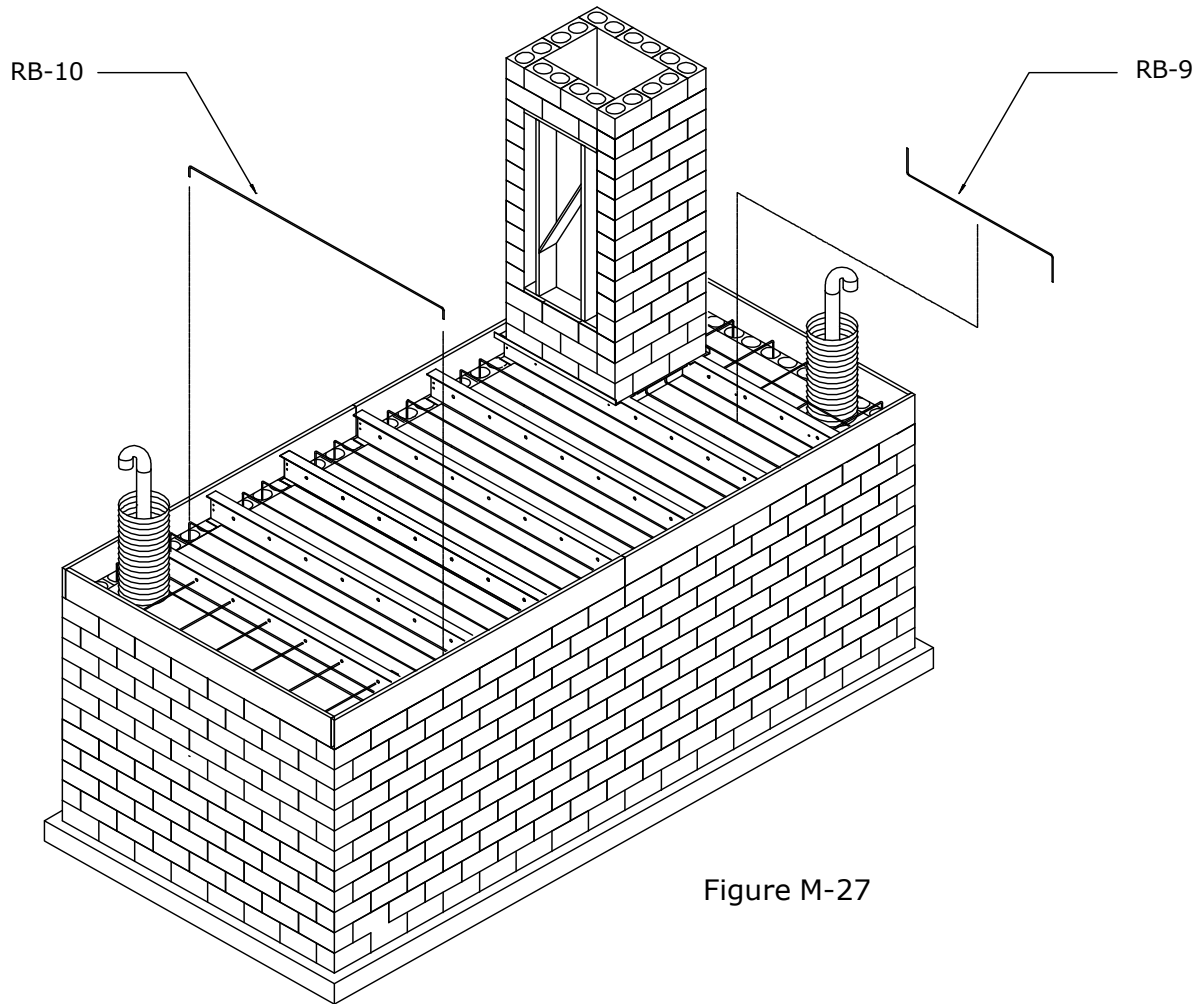


Figure M-27

RB-9 2 pieces: 63.1/2-inches x 10-inches
RB-10 12 pieces: 111.1/2-inches x 4-inches

Tie all rebar intersection connections as shown in figures M-17 through M-20 earlier in this section.

Rebar installation — ceiling

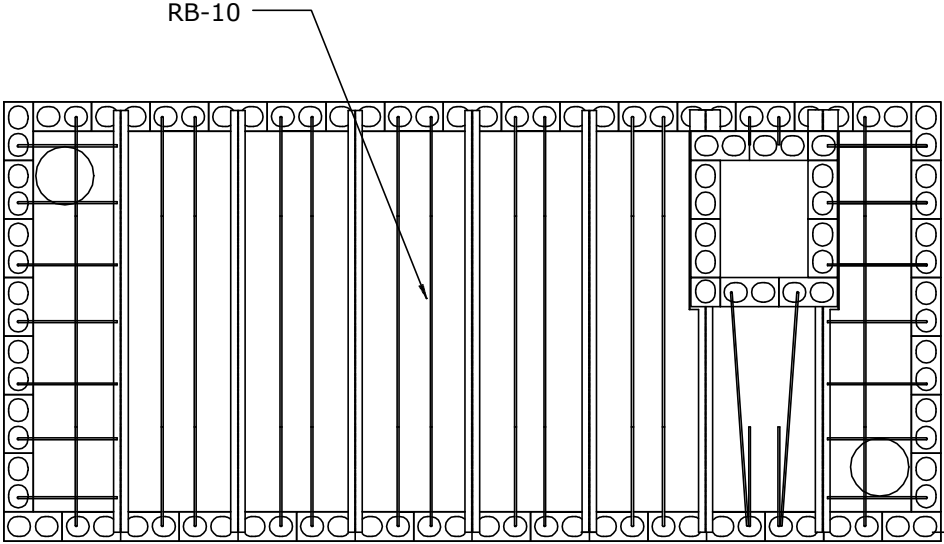


Figure M-28

Rebar installation — ceiling, continued

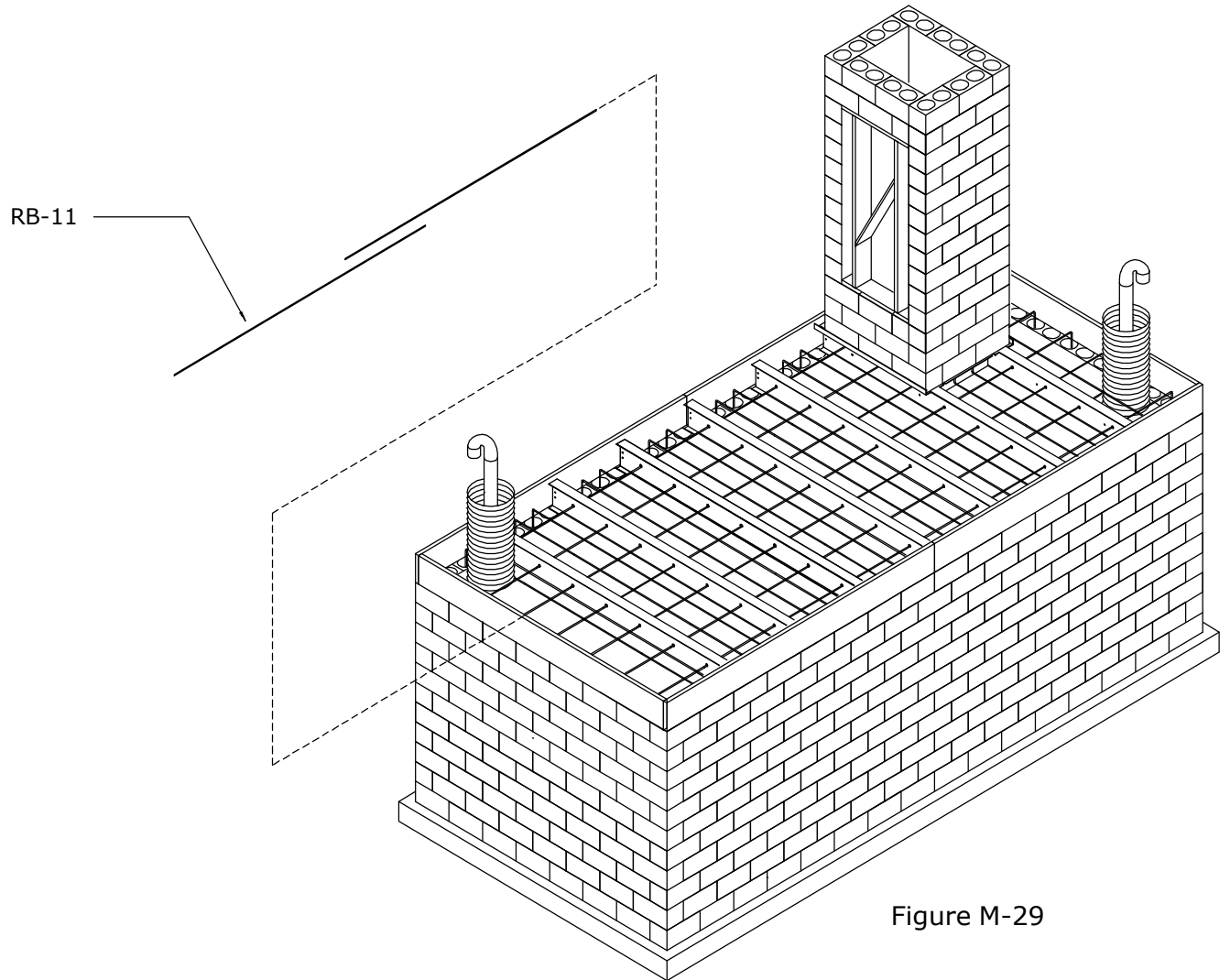


Figure M-29

Refer to Section I, rebar, ceiling kit
RB-11 14 pieces: 120-inches

Tie all rebar intersection connections as shown in Figure M-1 through Figure M-4 in this section.

Rebar installation — ceiling, continued

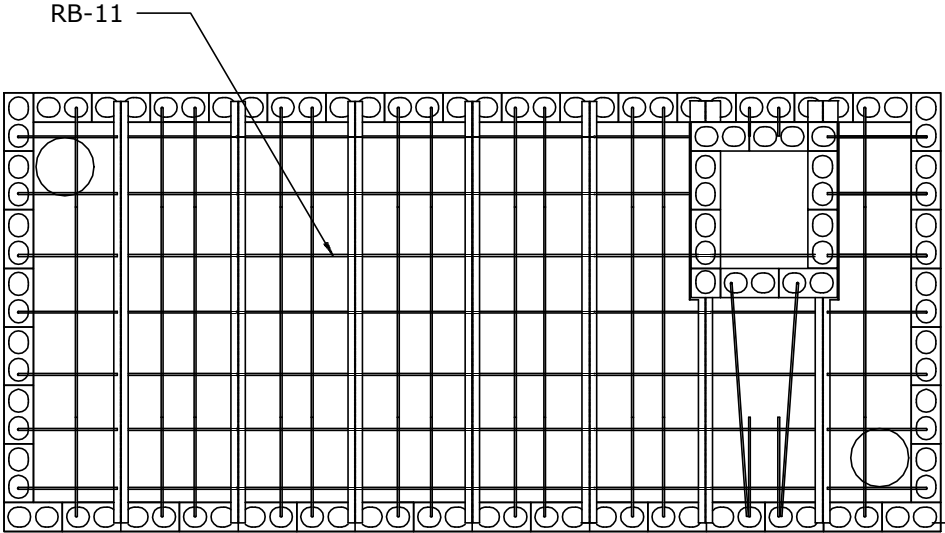


Figure M-30

Rebar installation — riser

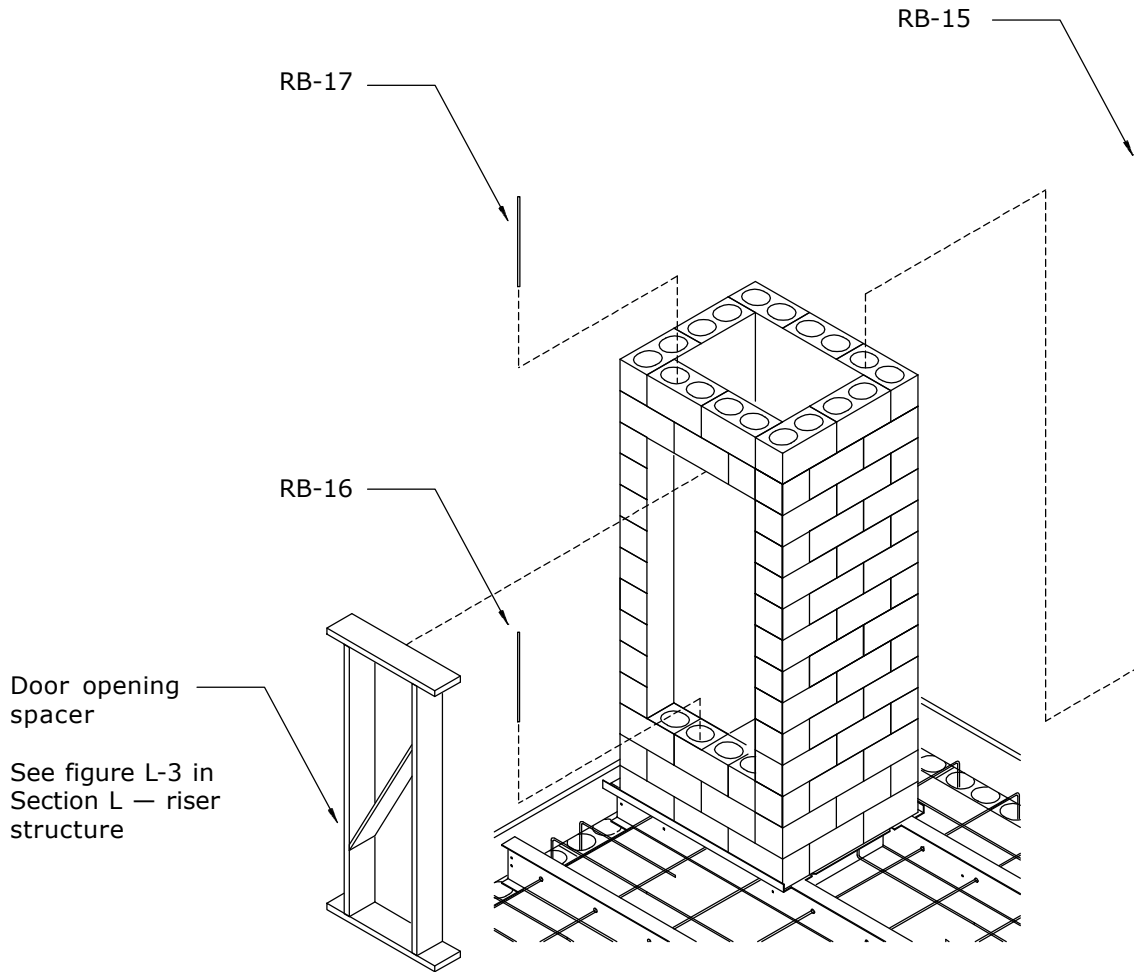


Figure M-31

- RB-15 14 pieces: 112-inches
- RB-16 4 pieces: 14-inches
- RB-17 4 pieces: 23-inches

Rebar installation — riser, continued

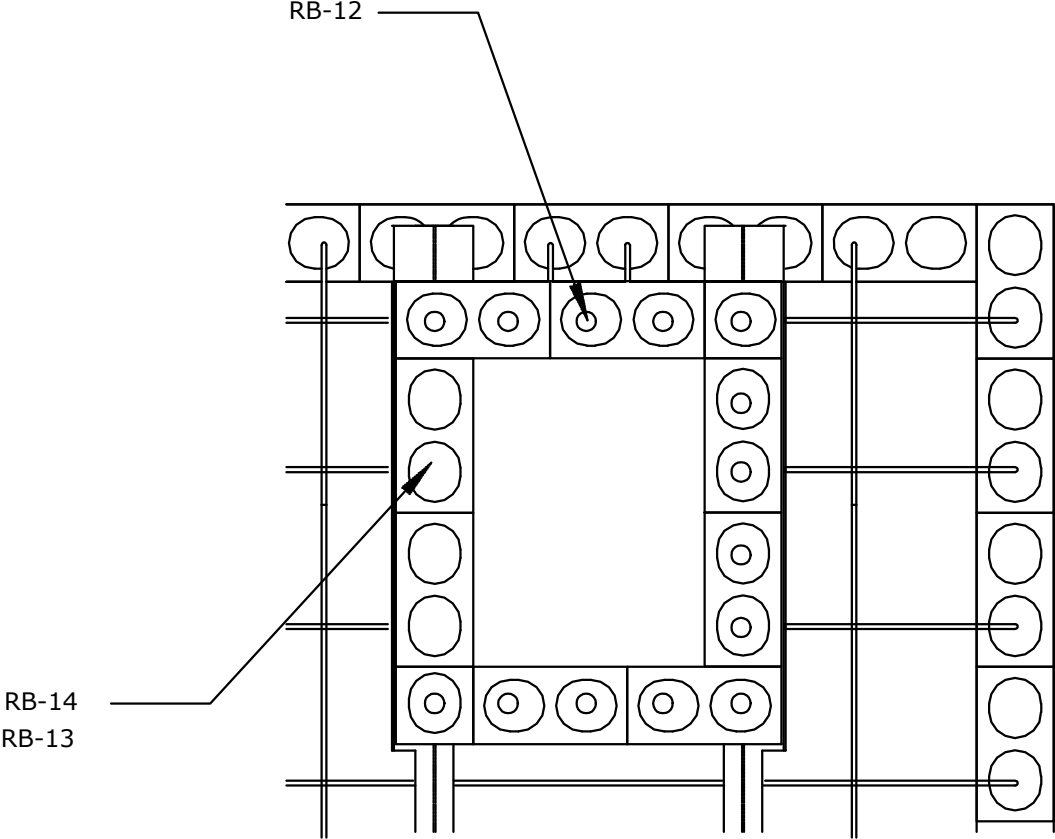


Figure M-32

Ingress/egress options — blast hatch

ASR-7200H series is a sealed 32-inch x 24-inch explosion resistant blast hatch door that offers excellent protection from extremely high pressure blast waves like those produced by a large conventional or nuclear device detonated in relatively close proximity.

The ASR series 7200H sealed blast doors are rated to withstand high pressure waves up to 7,200 pounds per square foot — that is 50 pounds per square inch (PSI). Additionally, this door also offer an air tight compression seal between the door and the frame allowing for the use of a positive pressure NBC filtration system inside the shelter.

Construction

The heavy steel frame is constructed from 5 inch by 3 inch by ¼-inch thick steel (angle iron) with the 3 inch leg serving as the high water barrier for the door. The 5 inch leg is predrilled for the concrete anchoring studs, and serves as a drilling template for locating the drill holes. Five sections of 2.1/2-inch steel tube sandwiched between two formed 3/16-inch steel plates creating a super strong H-beam design. Steel hinges with 5/8-inch diameter hardened steel pins are hidden when the door is closed.

Features

The single inside cam latch draw and lock the door tight to the gas seal. The latch handle is provided with a built in friction safety clutch to insure that the latch handle does not unintentionally creep from the open condition to the closed or latched condition. Such a mishap would render the door unable to be opened from the outside and in order to gain access removal of the entire door frame assembly would be required. The outside locking assembly requires a user supplied paddle lock.

For your safety the paddle lock and bolt assembly are lockable in both the unlocked and locked condition and are completely removable from the tamper proof enclosure when the shelter is occupied. Large two handed grip heavy duty handles constructed from steel tube and plate are located on both the inside and outside of the door.

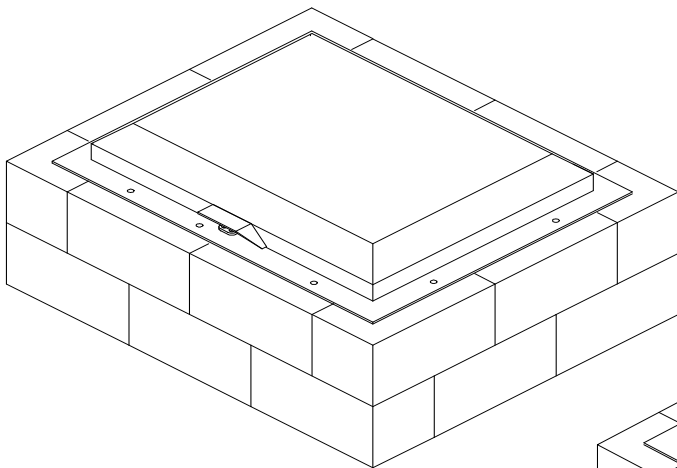


Figure N-1

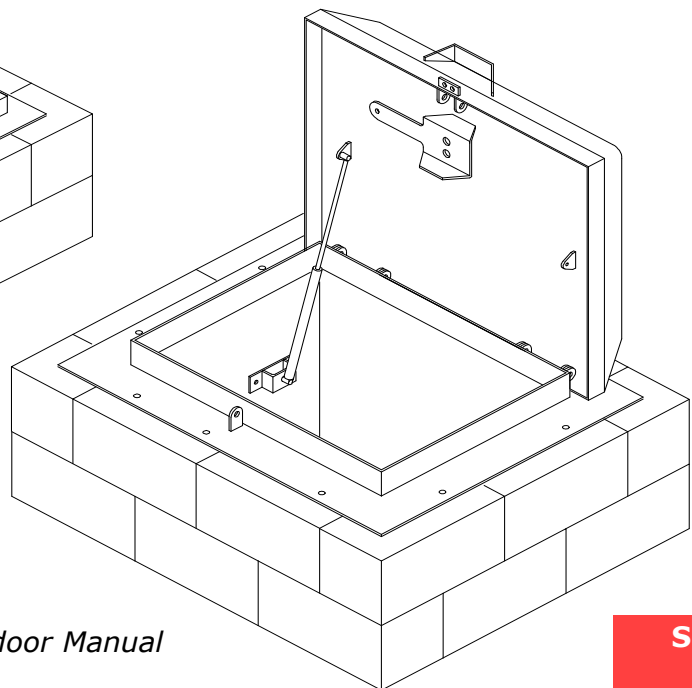


Figure N-2

For more information, consult the *Hatch door Manual*

Ingress/egress options — blast door

ASR-7200V series is a sealed, pre-hung explosion resistant blast door that offers excellent protection from extremely high pressure blast waves like those produced by a large conventional or nuclear device detonated in relatively close proximity.

The ASR series 7200 sealed blast doors are rated to withstand high pressure waves up to 7,200 pounds per square foot — that is 50 pounds per square inch (psi). Additionally, this door also offer an air tight compression seal between the door and the frame allowing for the use of a positive pressure NBC filtration system inside the shelter.

Please see next page for the legend of the lettered arrows below.

For more information, consult the *Hatch door Manual*

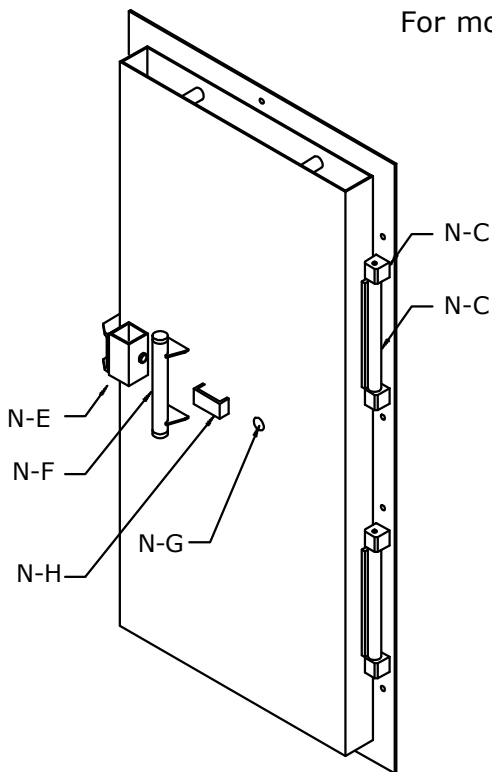


Figure N-3

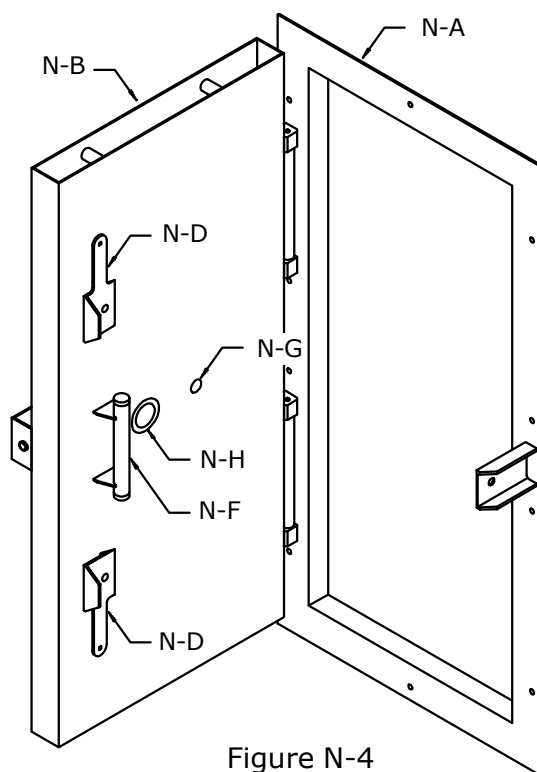


Figure N-4

Ingress/egress options — blast door, continued

Legend for parts from previous page

N-A — door frame

The heavy steel frame is constructed from 5 inch by 3 inch by ¼-inch thick steel (called angle iron) with the 3 inch leg serving as the centering guide for hanging the door. The 5 inch leg is pre drilled for the concrete anchoring studs, and serves as a drilling template for locating the drill holes.

N-B — door skin

The formed and welded heavy 3/16-inch thick steel skin which forms the pocket in which to pour the reinforcement concrete after hanging the door.

N-C — hinges

The two vault style 1.1/2-inch diameter steel hinges are captured in externally grease able bronze knuckle bearings. This robust assembly allows for both high strength and precision closure to insure the proper alignment and compression of the gas seal.

N-D — inside cam latches

The two inside cam latches draw and lock the door tight to the gas seal. The upper and lower latch handles are provided with a built in friction safety clutch to insure that the latch handles do not unintentionally creep from the open condition to the closed or latched condition. Such a mishap would render the door unable to be opened from the outside and in order to gain access removal of the entire door frame assembly would be required.

N-E — outside lock

The outside locking assembly requires a user supplied paddle lock. For your safety the paddle lock and bolt assembly are lockable in both the unlocked and locked condition and are completely removable from the tamper proof enclosure when the shelter is occupied.

N-F — heavy duty pull handles

Large two handed grip heavy duty handles constructed from steel tube and plate are located on both the inside and outside of the door.

N-G — security viewer

The wide angle security is located center of the door cavity, its heavy internal steel enclosure adds structural support to the steel door envelop.

N-H — optional differential pressure gauge

The optional differential pressure gauge is used to monitor the shelter overpressure when a positive pressure NBC filtration unit is installed. This sensitive gauge measures the differential air pressure between the shelter and outside in inches of water column (inches of water column). The range is 0-1/2 inches of water column. The gauge system includes a capillary blast valve and a steel debris guard over the outside pilot sampling tube to insure no damage to the delicate gauge in the event of a nearby high energy explosion.

Ingress/egress options — ladder installation

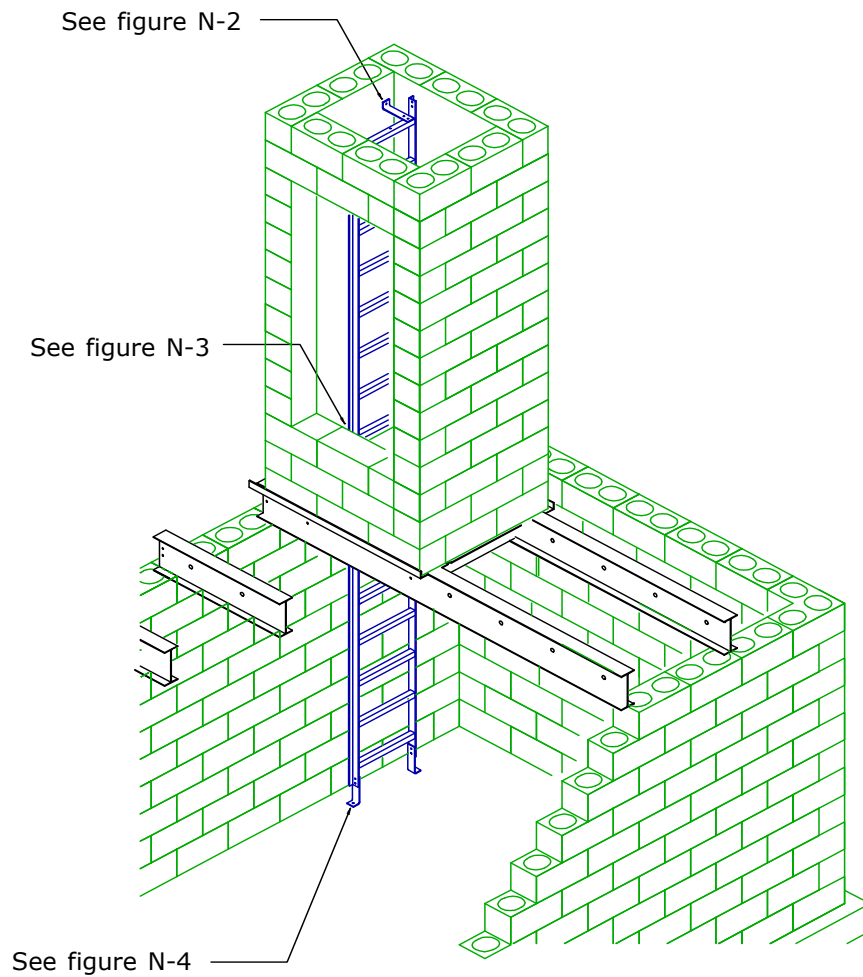


Figure N-1

The ladder kit comes as two 8-foot ladder sections and four mounting brackets with all the necessary mounting hardware.

Ingress/egress options — ladder installation, continued

For construction dimensions consult the detailed
Parts Drawings Manual

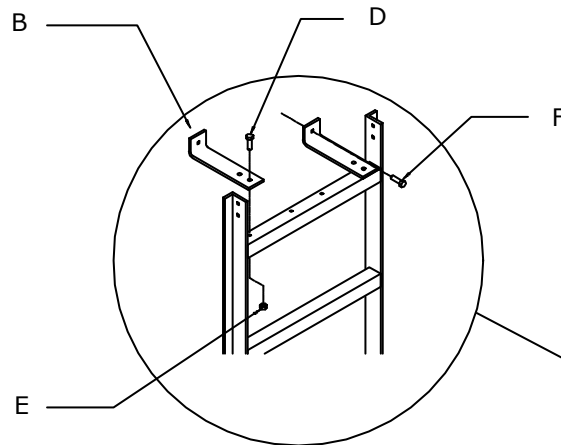


Figure N-2

Ladder kit contents

- A 2-each ladder sections
- B 4-each mounting brackets
- C 2-each coupling plates
- D 14-each hex bolts
- E 14-each hex nuts
- F 4-each concrete anchors

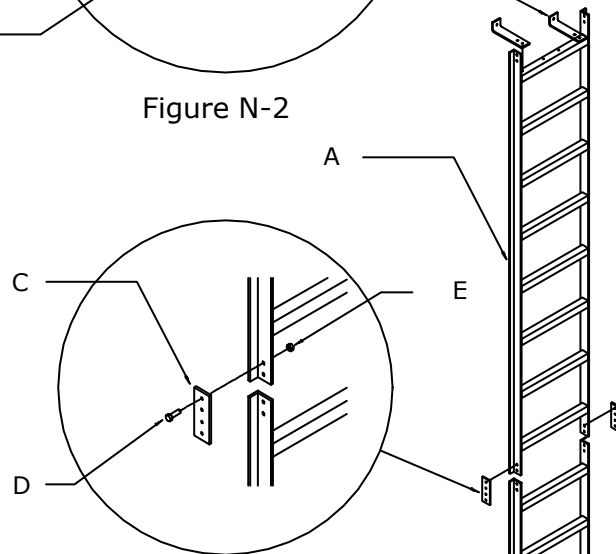


Figure N-3

Figure N-2

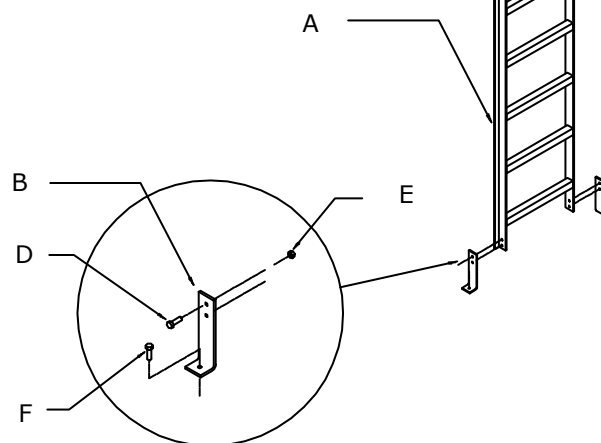


Figure N-4

Ceiling — pouring the concrete

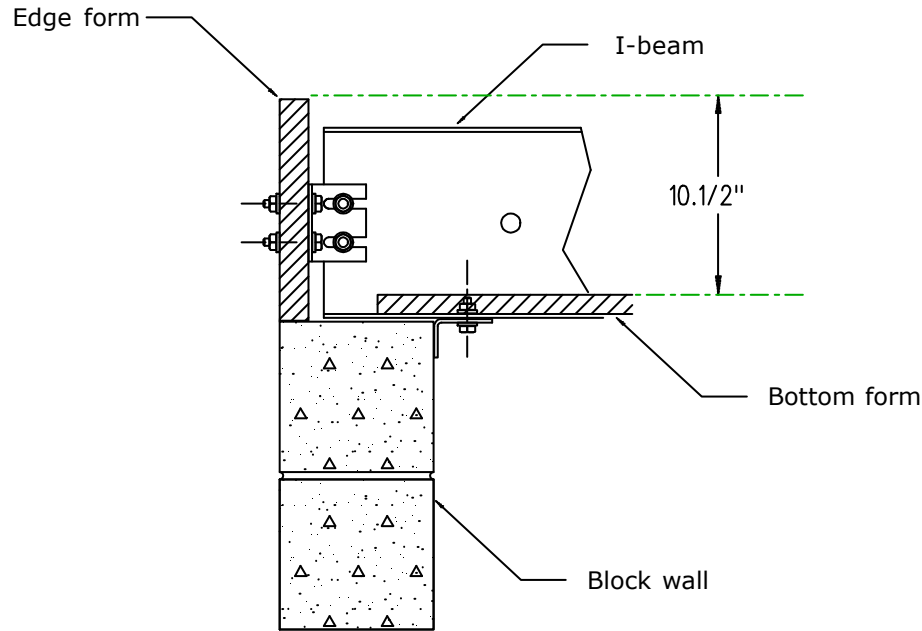


Figure K-1

The block wall cavities and ceiling cavity are poured in a **single pour**.

Each 10-foot section of 8-foot high wall will require 0.95 cubic yards of concrete (just under one cubic yard). The total wall including the standard riser is approximately 70-feet or 6.65 cubic yards.

The ceiling of 10-feet x 21.5-feet x 10.1/2-inches requires 6.9 cubic yards of concrete.

The total concrete requirement for the walls and ceiling is 13.6 cubic yards of 4,000 PSI high strength concrete.

Note: for more general information on pouring the concrete, see the page in Section G that details the foundation pour.

- 1 Make sure all form boards are securely in place, and can not slip or fail.
- 2 Allow no personal inside the shelter while the pour is curing, or for 12 hours after the pour.
- 3 Start pour around the perimeter tamping the concrete into the block wall cavities.
- 4 When all of the block wall cavities are filled to capacity — and fully tamped to remove voids, redirect the concrete flow onto the ceiling area until a even depth of 10.1/2-inches is achieved.

CAUTION

Exceeding this pour depth or heavy mounding of the wet concrete can cause bottom form failure.

- 6 Fill the riser block wall cores in the same manner as the walls.
- 7 Screed (level and finish the surface) and finish the ceiling and let cure before attempting the water sealing process.

Sealing the walls and ceiling

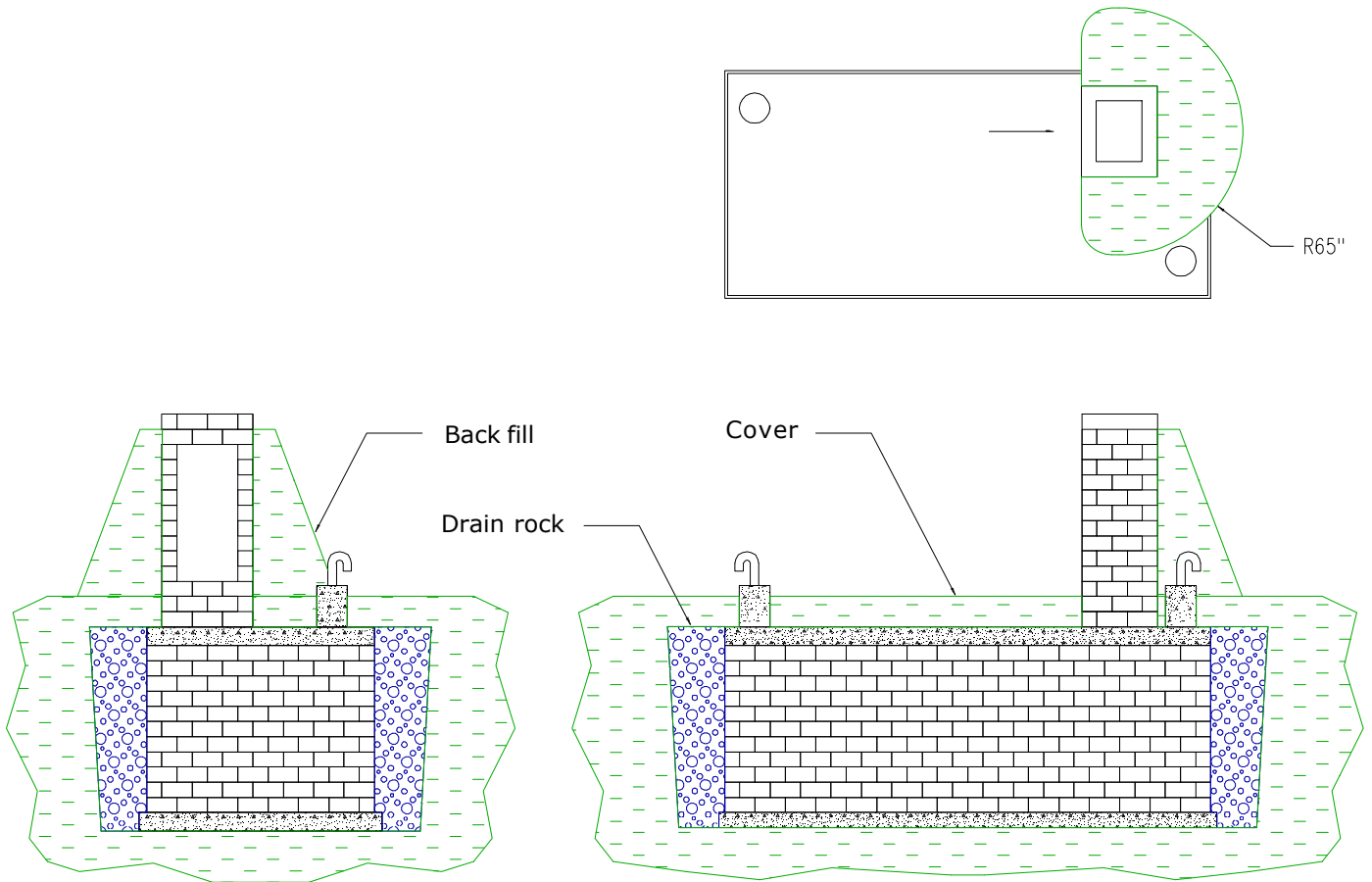


Figure P-1

Moisture sealing ceiling and walls

Fill any cracks with hydraulic cement then apply a thick tar and 6-mil plastic on outside of walls and ceiling.

This lessens the chance of migration of water through the water due to hydrostatic pressure on the outside of the wall caused from tons of dirt above the shelter.

Also, remove any roots from trees and large bushes that also can crack a wall. This is the only way to stop water vapor and moisture from entering your wall which causes mold and efflorescence (water moving through a wall or other structure that brings natural salts to the surface of the masonry).

Backfill with 100% pea stone before backfilling over the shelter. This will allow water to drain to the sides and ends of the shelter and not be trapped on the shelter roof.

Optional equipment — electrical connection kit

CAUTION

The installation of the items in this section must be carried out **BEFORE** the ceiling/wall pour of concrete. Some of these parts are poured in place.

Included in this optional kit is the following electrical assembly with 50-feet of 10-gauge, 3-wire direct burial cable. Please specify that you want this optional item at time of ordering — there is an additional charge for this kit.

The required trench for the electrical wire is 4-inches wide by 12-inches deep. While backfilling the electrical wire trench, it is recommended that a yellow warning tape be buried 4-inches under the surface to avoid accidental damage during any possible future digging.

The installation of these electrical assemblies must be conducted by a qualified electrician, and any required local building permits must be obtained prior to installation.

All of these parts are included in this kit:

- Q-1 through the ceiling watertight connector assembly
- Q-2 feeder conduit and wire
- Q-3 30-amp fused disconnect
- Q-4 GFCI protected 3-prong outlets

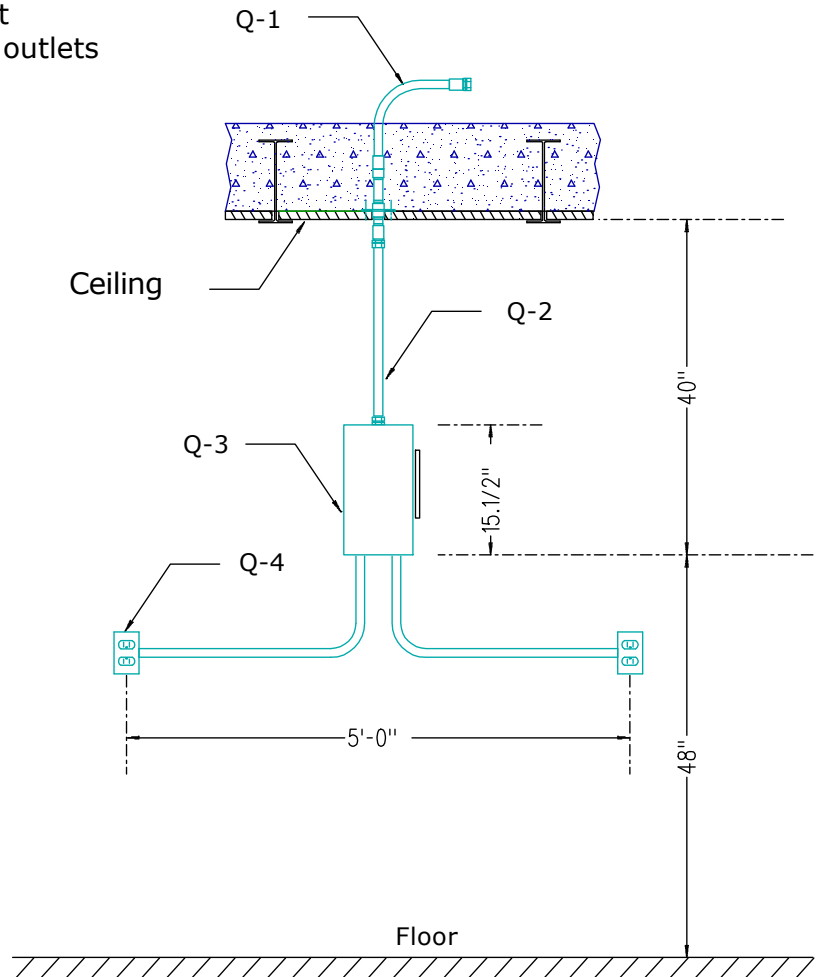


Figure Q-1

For complete dimensions of these parts, consult the *Detailed Parts Drawings Manual* available at: www.AmericanBombShelter.com

Optional equipment — plumbing kit

CAUTION

The installation of the items in this section must be carried out **BEFORE** the ceiling/wall pour of concrete. Some of these parts are poured in place.

The total hardware cost of the toilet assembly is around \$1,000.00

Parts R-1 through R-5 (all items shown on the next page) are furnished with the ventilation kit hardware.

Parts R-6 through R-14 are furnished as the toilet connection kit. Please specify that you want this optional item at time of ordering — there is an additional charge for this kit.

Parts R-A through R-H are furnished by the end user.

The cost of the toilet, which can be found a building supply store, is about \$100.00

The cost of the Zoeller, "Qwik Jon®" is about \$600.00

The Zoeller Qwik Jon, catalog sheet can be downloaded here:

<http://www.zoeller.com/zcopump/zcopdfdocs/FM0692.pdf>

The Zoeller Qwik Jon, installation instructions can be downloaded here:

<http://www.zoeller.com/zcopump/zcopdfdocs/FM1469.pdf>

The contact information for the factory is:

Zoller Pump Company

3649 Cane Run Road

Louisville, Kentucky. 40200-1961

Telephone: 800-928-7867

502-778-2731

Item index for the drawing on the next page:

R-1 exhaust ventilation pipe

R-2 blast valve

R-3 fastener bolts, 8 each

R-4 fastener nuts, 8 each

R-5 overpressure valve

R-6 Y-connection

R-7 flanged trough the ceiling drain pipe

R-8 fastener screws, 4 each

R-9 fastener nuts, 4 each

R-10 threaded 2-inch pipe coupling pipe to 2" PVC pipe

R-11 flanged through the ceiling water pipe

R-12 fastener screws

R-13 threaded 3/4-inch pipe coupling pipe to 3/4-inch PVC pipe

R-14 3/4-inch male to 1/2-inch female PVC nipple reducer

R-A 1/2" shut off valve

R-B 1/2" toilet connection pipe

R-C toilet

R-D Zoller, "Qwick Jon®" Model number 100 with sewage pump — part number WM264

R-E vent pipe 3-inch PVC

R-F 2-inch shut off valve

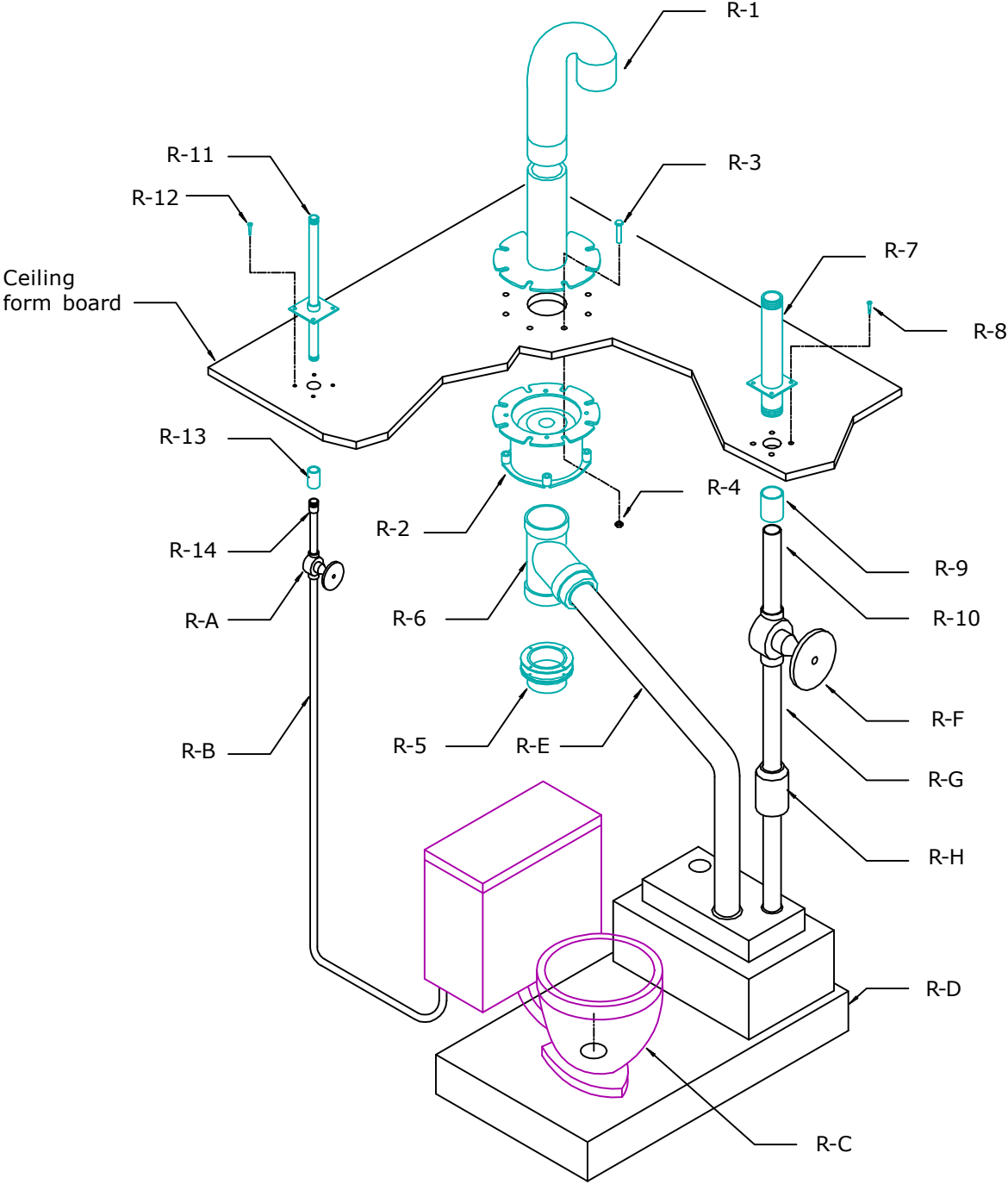
R-G 2-inch PVC pipe

R-H anti-backflow device

This system is recommended because of its cost effectiveness and that the this system allows for the addition of a sink and shower.

See the Zoeller Qwik Jon installation manual pages 6 and 7 for plumbing of additional fixtures such as showers and sinks.

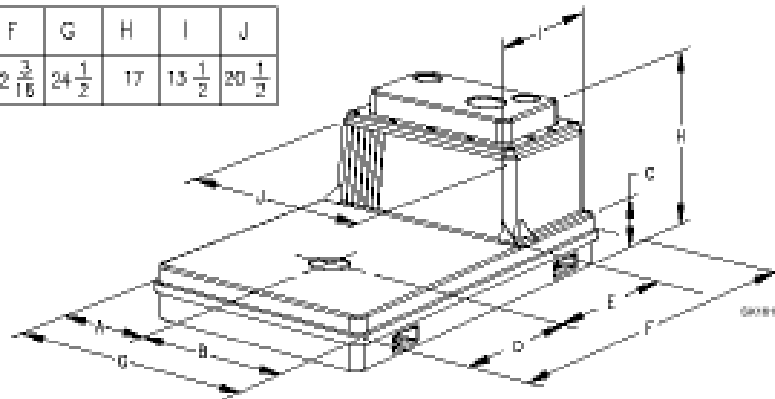
Optional equipment — plumbing kit, continued



Optional equipment — plumbing kit, continued

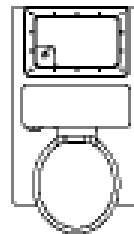
A	B	C	D	E	F	G	H	I	J
12 $\frac{1}{4}$	12 $\frac{1}{4}$	5 $\frac{1}{2}$	13 $\frac{1}{4}$	14 $\frac{1}{8}$	42 $\frac{3}{16}$	24 $\frac{1}{2}$	17	13 $\frac{1}{2}$	20 $\frac{1}{2}$

All dimensions are in inches.



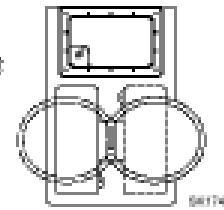
DIMENSIONS A,B,D,F,& G ARE FROM THE WELD

Determine the orientation of Toilet on Tank.
This determines the location of the long bolts in
STEP 3 of the installation. Refer to Figure 2.1 or
Figure 2.2.

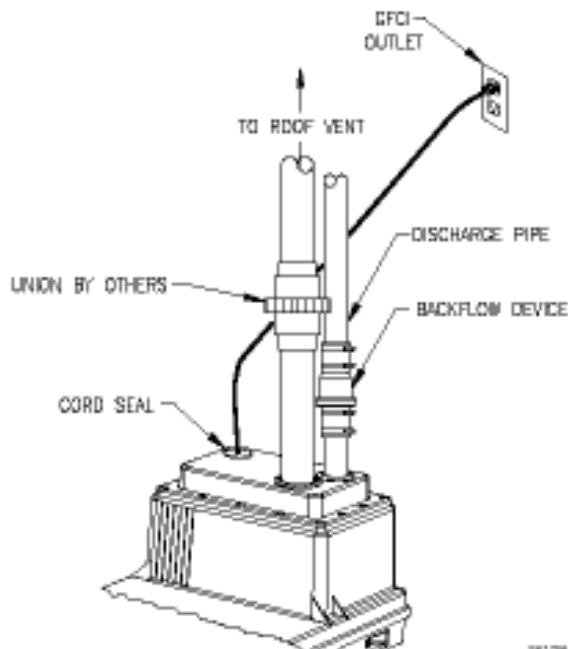


FORWARD INSTALLATION
Forward Installation
Figure 2.1

OR



SIDE INSTALLATIONS
Side Installation
Figure 2.2



000706

Load calculations - trusses

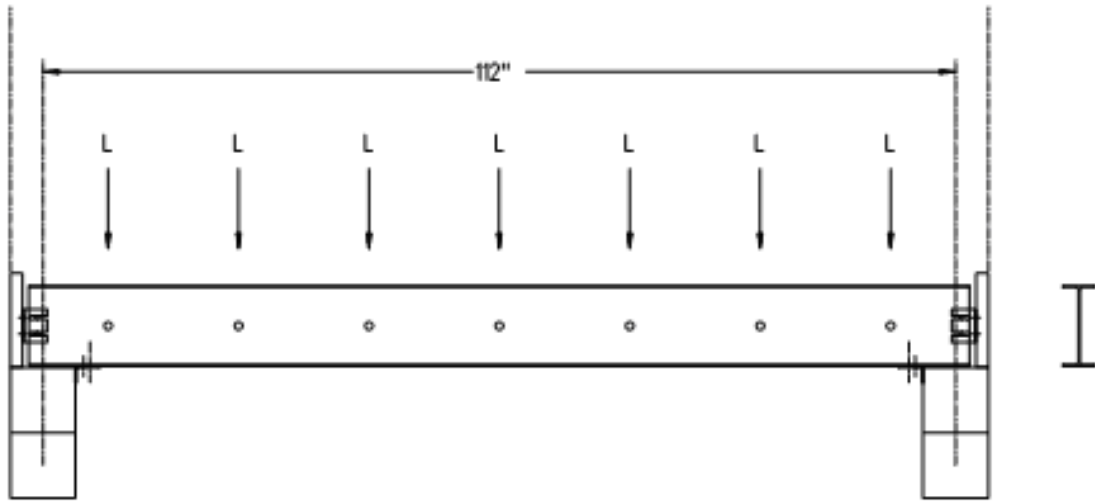


Figure S-1

Stress	6259.01 PSI
Deflection	0.055 inches
Load	3,677.77 pounds
Moment	51,488.73 inch-pounds
Stress limit	18,000.0 PSI
Deflection limit	0.622 inches
Inertia	40.60 inches ⁴
Section Modulus	8.22 inches cubed
Weight	93.77 pounds
Length	112.0 inches
Height	9.87 inches
Area	3.04 inches squared
Module of elasticity	30,000,000.0 PSI
Density	0.283 pounds per inch cubed
Material	10.0 inch wide flange beam
Flange thickness	0.210 inches
Web thickness	0.190 inches
Flange width	3.960 inches
Length	112.0 inches

$$M = \frac{FL}{8}$$

$$D = \frac{FL^3}{76.8EI}$$

Figure S-2

Condition: uniform load ends free to rotate

Use: this condition represents a load of poured concrete 10-inches deep x 32-inches wide over the 112-inch span creating a combined load of 3,677.77 pounds.

Load calculations - ceiling forms

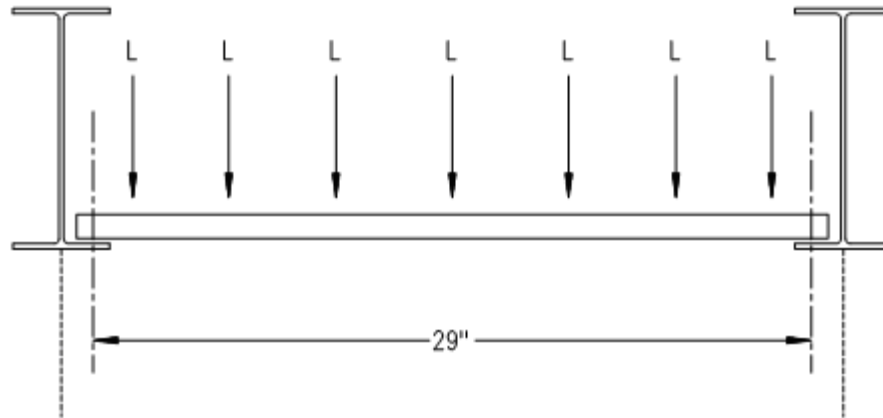


Figure S-3

Stress	643.37 PSI
Deflection	0.066 inches
Load	354.96 pounds
Moment	1286.73 inch-pounds
Stress limit	1400.0 PSI
Deflection limit	0.161 inches
Inertia	1.0 inches ⁴
Section Modulus	2 inches cubed
Weight	6.96 pounds
Length	29.0 inches
Height	1.0 inches
Width	12.0 inches
Module of elasticity	1,700,000.0 PSI
Density	0.02 inch-pounds
Material	CDX plywood
Thickness	1.0 inch
Length	29.0 inches
Width	12.0 inches

$$M = \frac{FL}{8}$$

$$D = \frac{FL^3}{76.8EI}$$

Figure S-4

Condition: uniform load ends free to rotate

Use: this condition represents a uniform load of poured concrete 10-inches deep x 12-inches wide over the 29-inch span creating a combined load of 354.96 pounds

Load calculations - ceiling forms, continued

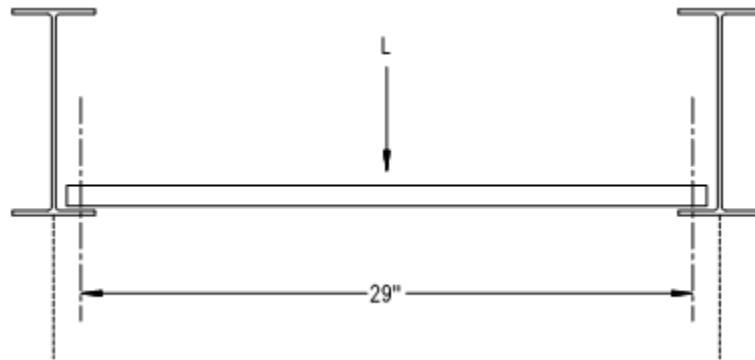


Figure S-5

$$M = \frac{FL}{4}$$

$$D = \frac{FL^3}{48EI}$$

Figure S-6

Stress	1402.73 PSI
Deflection	0.116 inches
Load	386.96 pounds
Moment	2805.46 inch-pounds
Stress limit	1400.0 PSI
Deflection limit	0.161 inches
Inertia	1.0 in ⁴
Section Modulus	2.0 cubic inches
Weight	6.96 pounds
Length	29.0 inches
Height	1.0 inches
Width	12.0 inches
Module of elasticity	1,700,000.0 PSI
Density	0.02 pounds per cubic inch
Material	CDX plywood
Thickness	1.0 inches
Length	29.0 inches
Width	12.0 inches

Condition: center load ends free to rotate

Use: this condition represents a 380 pound man standing with legs together at center span during construction creating a combined load of 386.96 pounds.

Load calculations - ceiling

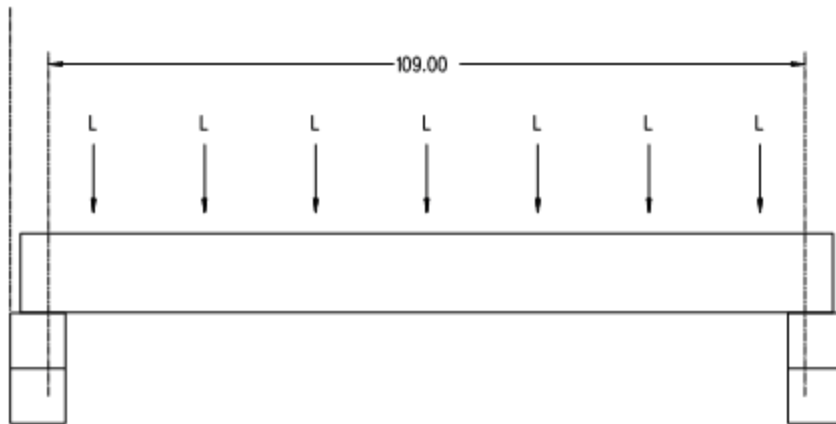


Figure S-7

$$M = \frac{FL}{8}$$

$$D = \frac{FL^3}{76.8EI}$$

Figure S-8

Stress	4978.44 PSI
Deflection	0.616 inches
Load	194,874.60 pounds
Moment	2,655,166 inch-pounds
Stress limit	5,000 PSI
Deflection limit	0.606 inches
Inertia	2666.67 inches ⁴
Section Modulus	533.33 cubic inches
Weight	3034.56 pounds
Length	109.0 inches
Height	10.0 inches
Width	32 inches
Module of elasticity	2,000,000.0 PSI
Density	0.087 pounds per cubic inch
Concrete	4000.0 PSI
Thickness	10.0 inches

Condition: uniform load ends free to rotate

Use: this condition represents a load of a cured concrete slab 10-inches deep x 32-inches wide over the 109-inch span with an applied load of 55 PSI creating a combined load of 194,874.60 pounds.