Residential Bearing Wall Removal

Removing a bearing wall offers many benefits to a homeowner. Maybe you desire a more open floor plan and would like the wall between your living room and kitchen to be removed. Or maybe it is time to finally install that pool table in the basement, but there is just not enough room for it with that bearing wall in the way. Whether it's for aesthetics, practicality or to increase the value of your home, removing a bearing wall could be a feasible solution. However, there are many things to consider: What is the wall supporting? What happens when the wall is removed? How do I remove the wall safely? Do I need an engineer? This article will provide basic answers to those questions and help you determine whether or not removing a bearing wall in your home is a practical solution.

What is a bearing wall and what does it do?

Bearing walls are walls that typically support roof loads, floor loads and/or wall loads. Bearing walls usually consist of 2x4 or 2x6 studs, masonry, brick or concrete, with or without openings. Bearing walls commonly stack from level to level and are ultimately supported by a foundation. While every house is different and may present unique situations, figure 1 shows a typical section of a house. You can see that the ceiling joists are supported by the exterior bearing walls and the interior bearing wall. As we move to the main level, you can see that the interior bearing wall in the basement supports the main level floor joists as well as the bearing wall above. This lower level bearing wall is supported by a strip footing foundation.

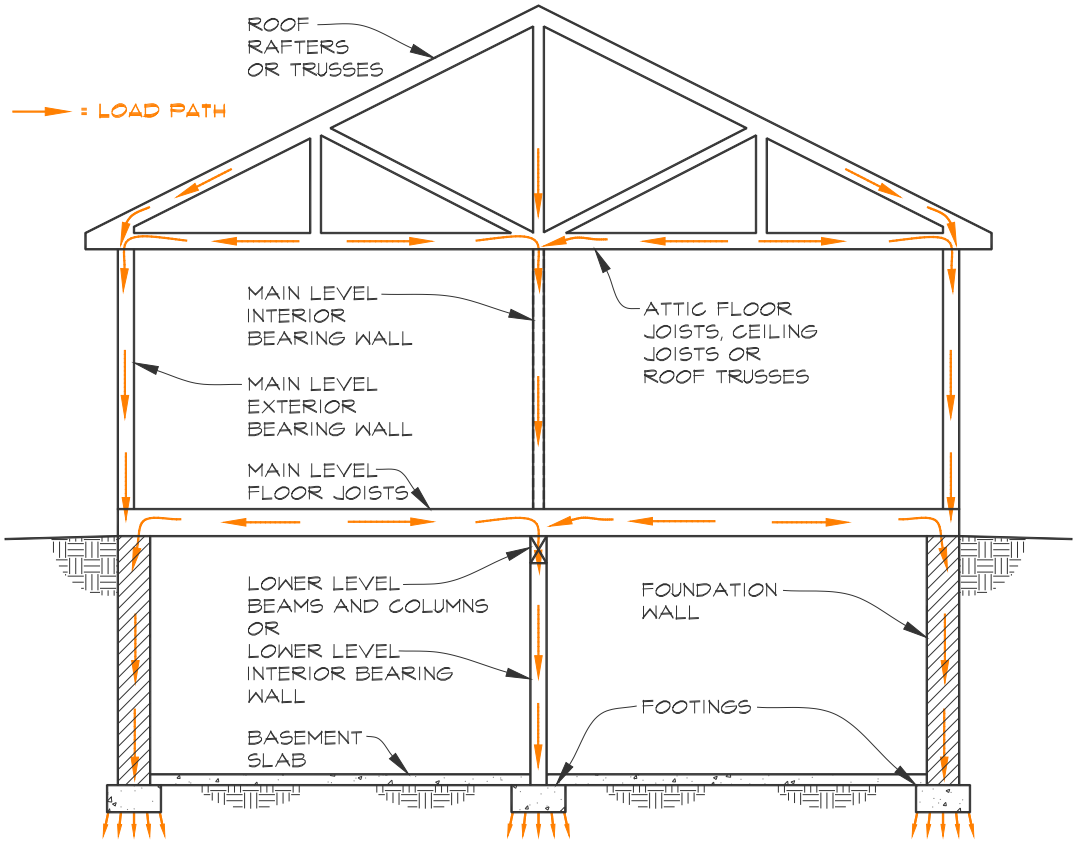

FIGURE 1: TYPICAL HOUSE SECTION

In the basement, it is common to see beams and columns in place of bearing walls. In this case, the beams support the first floor joists and the bearing wall above. The beams are supported by columns which are supported by a spread footing foundation. Homeowners sometimes wish to remove a basement column to open up the space even more. With the proper engineering design and construction, this can also be done. This article addresses the work of removing a bearing wall, but the ideas presented could be used in considering the removal of a column as well.

How do I start?

You must first determine whether or not the wall in question is really a bearing wall. One obvious sign that the wall you want to remove is a load bearing wall, is that the floor or ceiling joists are spliced or are discontinuous over the wall, see figure 2, or there might be another wall aligned immediately above this wall, see figure 3. If you are uncertain, now might be a good time to hire a structural engineer. If you know the wall is a bearing wall, prepare some basic sketches showing dimensions, elevations, wall locations and other distinguishing characteristics of the surrounding structure. This includes the areas above, around and below the wall. Typical sketches of this type of information are shown in figures 4, 5 and 6. These sketches are going to be very helpful in determining the loads that are carried by the wall and will help determine preliminary beam sizes.

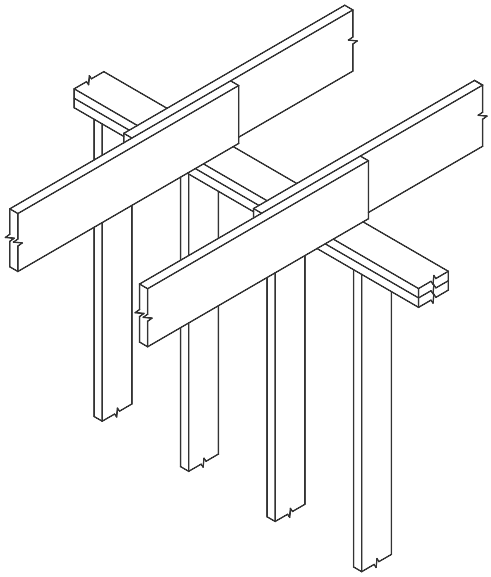

FIGURE 2: JOISTS SPLICED OVER THE WALL

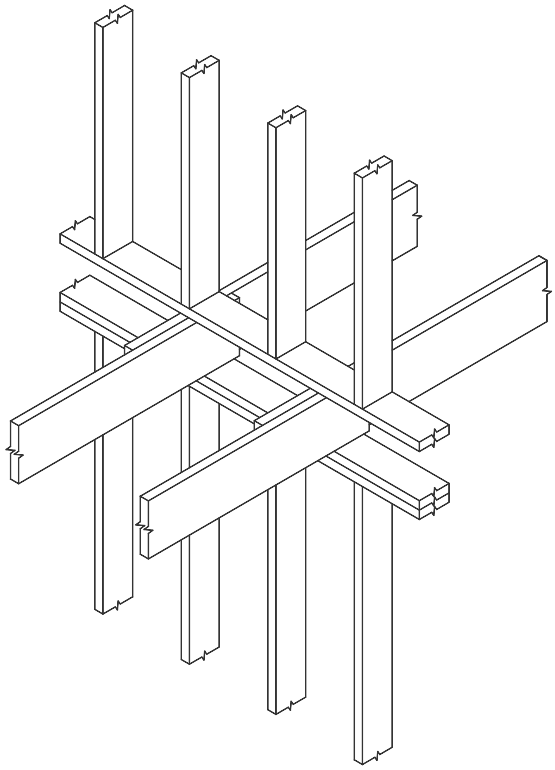

FIGURE 3: BEARING WALL SUPPORTING JOISTS AND WALL ABOVE

After this information is gathered, contact a structural engineer. The engineer may need to come to the house to determine snow loads, occupancy loads, dead loads (the weight of the permanent structure such as roofing materials, roof trusses, flooring, floor joists), and to obtain measurements and other unique features that may be critical to the design. Once this information is known, the engineer will design the required new member sizes, connections and configurations and prepare the required design documents. These documents can then be used by the homeowner to obtain the required permits and to hire a contractor. The contractor uses the structural engineer's drawings to determine the amount of materials needed, project timeline and overall construction cost of the project. It is important to know that a structural engineer does not design mechanical, electrical or plumbing systems. We encourage you to review these systems with a contractor in order to determine how removing a bearing wall may affect them.

If your remodeling project involves more than a bearing wall removal, then we often encourage homeowners to contact an architect. Even though you may be perfectly capable of illustrating your ideas on a set of homemade plans and details, an architect will typically consider elements that you might not think of; ceiling conditions, lighting and daylight effects, changes in traffic pattern, special finishes and coverings that might be needed, furniture and appliance layout and clearances. A short discussion with an architect about your ideas may be helpful and will give you a good sense if it might be wise to have an architect involved with your project.

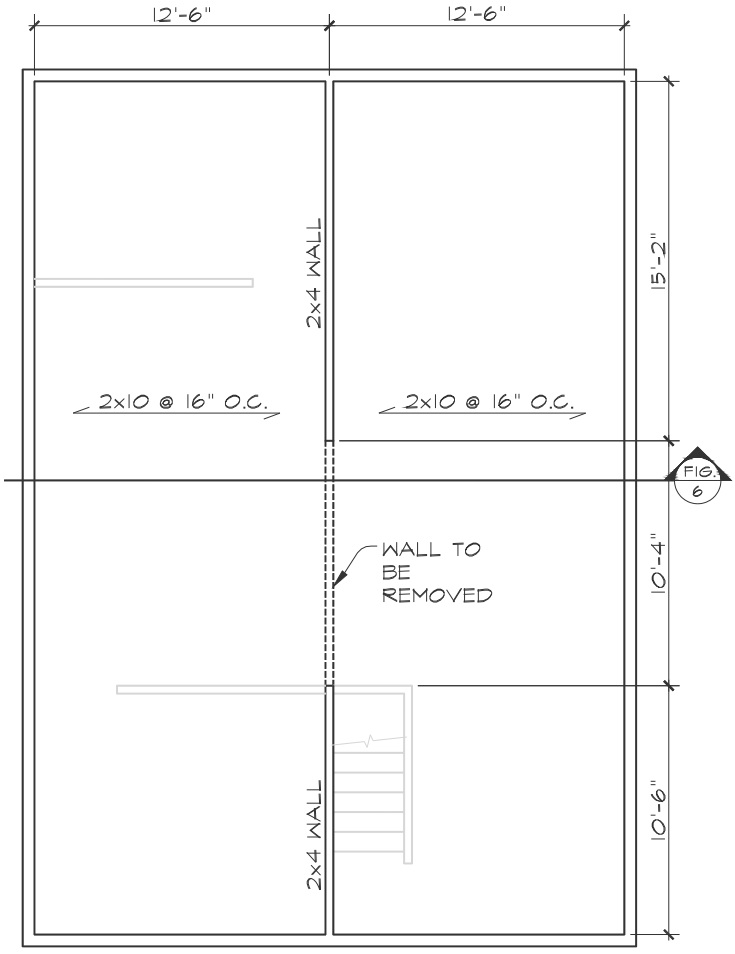

FIGURE 4: FLOOR PLAN

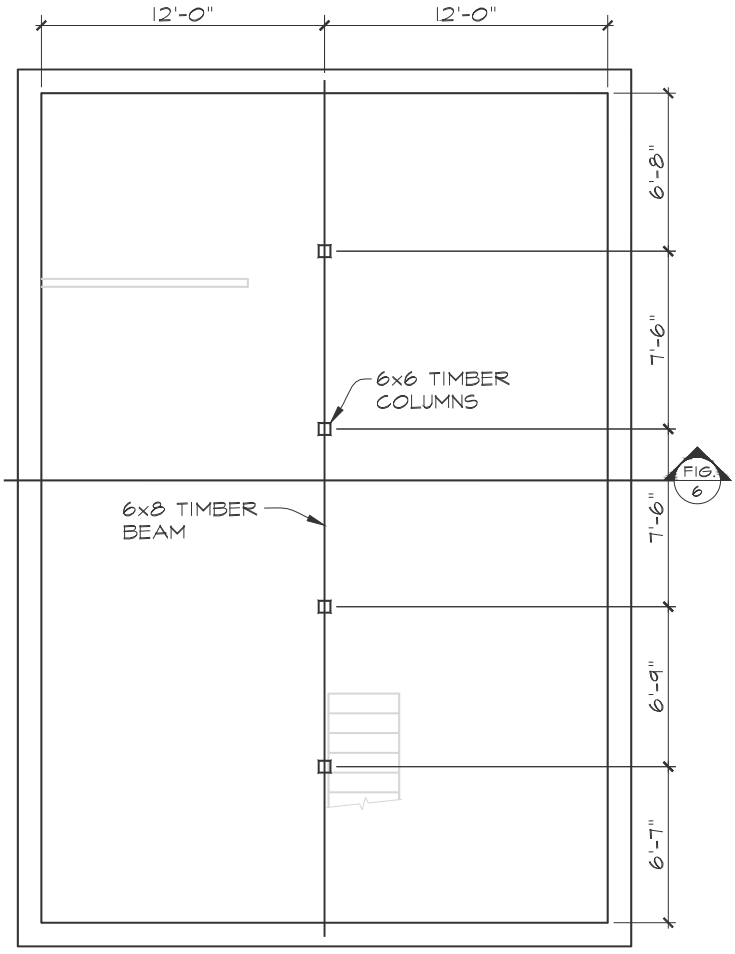

FIGURE 5: BASEMENT PLAN

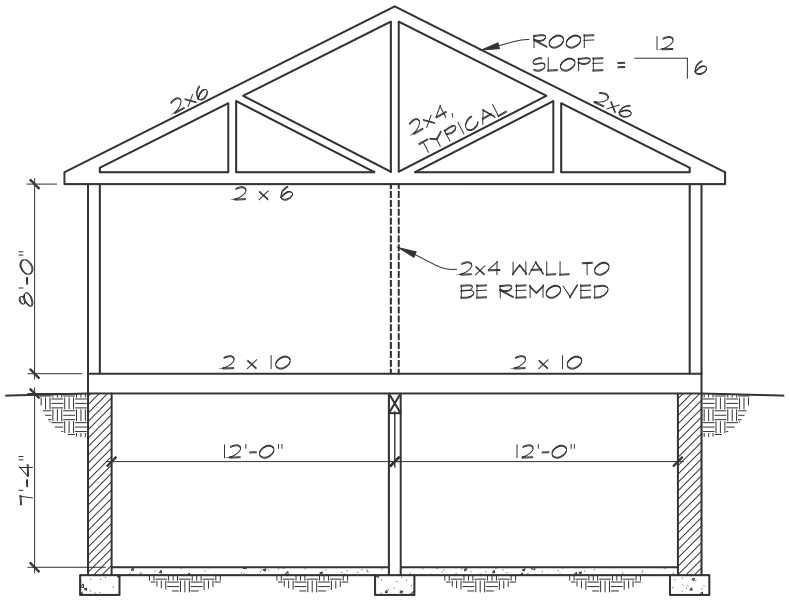

FIGURE 6: SECTION THROUGH HOUSE

Removing the bearing wall

After the design is complete and the contractor is selected, it is time to get to work! The existing structure is temporarily braced and shored by the contractor for removal of the bearing wall, see figure 7. Once the bearing wall is removed, the new support beam is installed, see figure 8. It is important to note that interior wall and/or ceiling finishes may crack during construction. These cracks may be repaired once construction is complete.

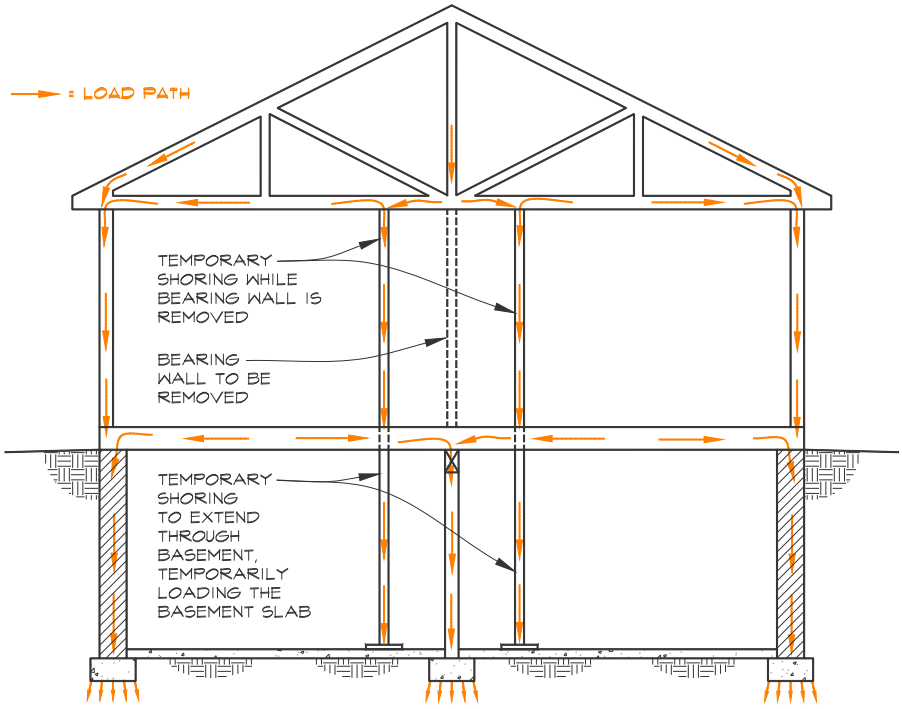

FIGURE 7: TEMPORARY SHORING

Depending on the span and loading conditions, the beam might consist of multiple plies of dimensional lumber, heavy timber beams, multiple plies of engineered lumber, solid engineered lumber or steel. There can be many different options for the new support beam. In general, longer span beams require deeper beam sizes. If head room is a concern, then a shallower, wider beam might be used. If the span and/or loads are significant, then a steel beam may be the only option. See table 1 for examples of typical beams for different opening conditions.

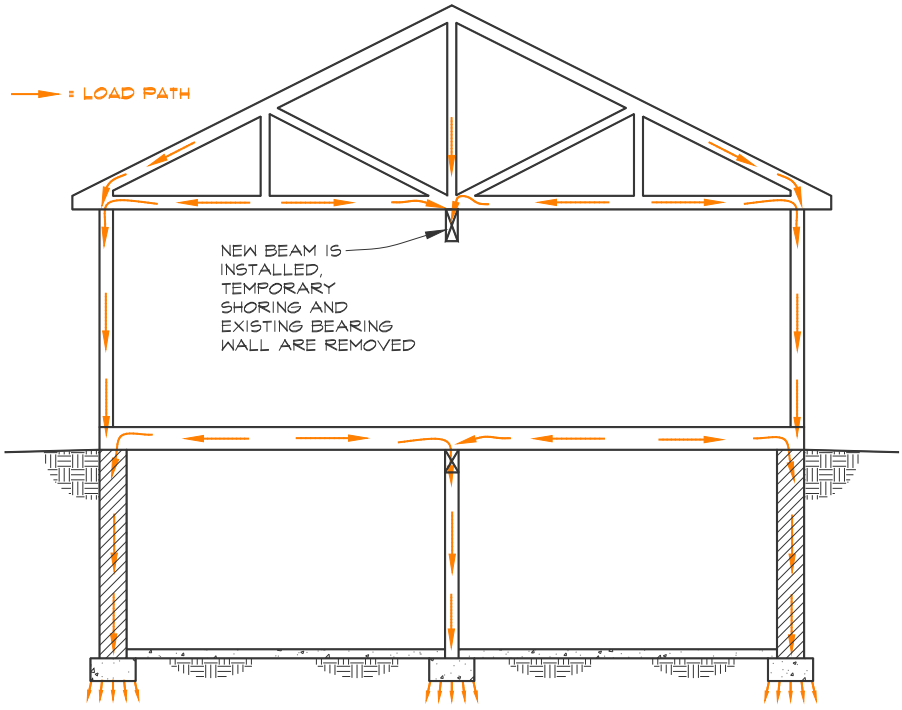

FIGURE 8: NEW BEAM INSTALLED

The beam will have to be supported by either a column or solid wall at both ends. Again, depending on the span and loading conditions, there are many different options for columns. For lighter loads, it is common to see multiple 2x4 or 2x6 studs, see figure 9. For intermediate loads, solid sawn lumber (4x4 or 6x6) or engineered lumber might be used. Square and round steel columns are common when supporting heavier loads, steel beams, or when tall columns are required, see figure 10. The load from these columns will have to be tracked through the floors below. If the structure below does not have sufficient capacity to support the new loads from the columns, then modifications will have to be made, or new structure must be installed. Ultimately, the load will need to work its way to the foundation, where a new spread footing may have to be installed.

Table 1: Examples of Typical Beams for Different Opening Conditions[1]	
10 ft Opening	
Roof Load Only	3 - 2 x 12 or 2 - 1 3/4" x 9 1/2" LVL[2]
Roof Load and Floor Load	2 - 1 3/4" x 11 7/8" LVL
15 ft Opening	
Roof Load Only	3 - 1 3/4" x 11 7/8" LVL
Roof Load and Floor Load	3 - 1 3/4" x 14" LVL or W8 x 31[3] Steel Beam
20 ft Opening	
Roof Load Only	4 - 1 3/4" x 16" LVL or W8 x 40 Steel Beam
Roof and Floor Load	4 - 1 3/4" x 18" LVL or W10 x 45 Steel Beam

1. Each load and span condition will vary. This table is for illustration purposes only and should not be considered a design.
2. LVL = Laminated Veneer Lumber - an engineered wood product
3. W8 x 31 = 8" deep and weighs 31 lbs per foot

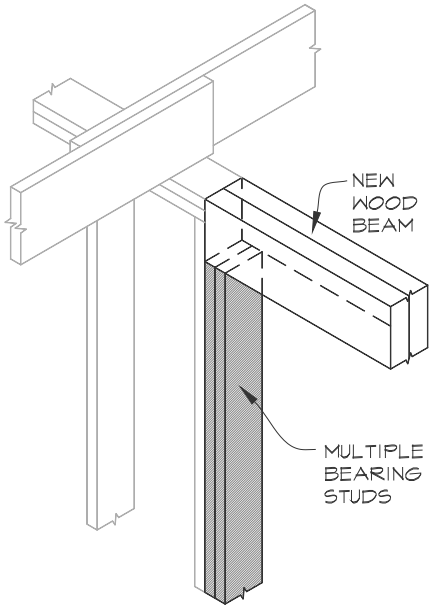

FIGURE 9: WOOD BEAM AND COLUMN

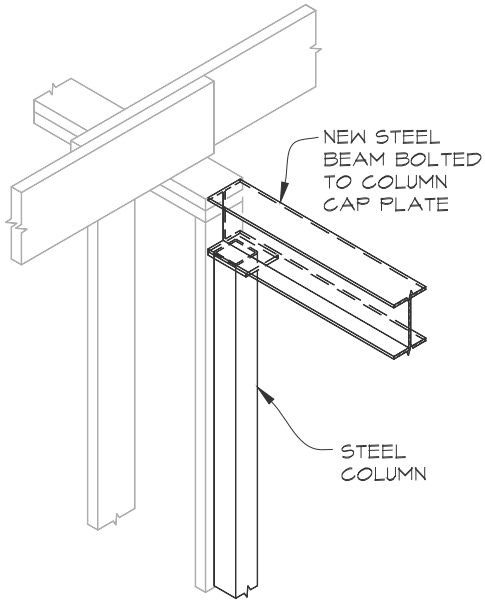

FIGURE 10: STEEL BEAM AND COLUMN

As you can see, a lot goes in to the planning, design and construction for removing a bearing wall. With the proper structural engineering design and construction, you could enjoy a more open floor plan, have increased accessibility and potentially increase the value of your home by removing a bearing wall. Images of a residential bearing wall before demolition, the installed beam during construction and the finished space are shown in figures 11, 12, 13, 14 and 15. For this project, a 4 – 1 3/4" x 14" LVL beam spanning approximately 19 feet and supporting roof structure was installed. You can see how removing the wall created a more open floor plan for the homeowners. If you are considering removing a bearing wall, we encourage you to discuss the implications with a structural engineer, architect and contractor to determine whether or not this is a practical solution to your needs.

Figure 11: Perspective 1 showing the existing interior bearing wall separating the kitchen from the living room

Figure 12: Perspective 1 showing the bearing wall removed and the new LVL beam installed

Figure 13: Perspective 1 showing the final condition with new finish materials, flooring, appliances, cabinetry and hardware

Images courtesy of Candlewood Carpentry

Figure 14: Perspective 2 showing the existing interior bearing wall separating the kitchen from the living room

Figure 15: Perspective 2 showing the final condition with new finish materials, flooring, cabinetry and hardware

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