A bridge assembly comprises a plurality of one-piece precast reinforced concrete bridge sections each formed by parallel space side walls integrally connected by an arcuate top wall. The side walls define a span between fifty and seventy five feet, and the top wall has a radius of curvature between sixty five and eighty feet. Each bridge section has a rise between the bottom of the side walls and the top of the inner surface of the top wall between ten and fourteen feet, and the outer surfaces of the side walls have a height between five and nine feet. Curved surfaces connect the inner surfaces of the side and top walls and have a radius of curvature between five and seven feet. The radius of curvature of the top wall is at least five times the rise and seven times the height of the side walls.
PRECAST CONCRETE BRIDGE ASSEMBLY

Background of the Invention

[0001] The present invention relates to precast concrete culvert or bridge assemblies or systems such as disclosed in U.S. Pat. Nos. 4,993,872 and 6,854,928 which issued to the assignee of the present invention and the disclosures of which are herein incorporated by reference. In a culvert or bridge assembly as disclosed in the '872 Patent, a plurality of one-piece and open bottom culvert or bridge units or sections are precasted of concrete with reinforcement and include parallel spaced side walls integrally connected by an arcuate top wall. Curved surfaces connect the inner surface of the arcuate top wall to the opposing inner surfaces of the side walls, and the outer surface of the top wall form angular corners with the opposing outer surfaces of the side walls. The construction of an open bottom precast concrete culvert or bridge section as disclosed in the above '872 Patent is satisfactory and usable up to a span between the side walls of about forty eight feet. However, it has been found that there is a need for one-piece open bottom precast concrete bridge sections each having a span significantly above forty-eight feet, for example, a span of sixty feet.

Summary of the Invention

[0002] The present invention is directed to an improved precast concrete bridge assembly and which is formed by a plurality of one-piece precast concrete bridge sections each having a span greater than fifty feet and capable of supporting the substantial loads of the compacted soil surrounding the bridge assembly as well as the loads of a roadway extending above the bridge assembly and the motor vehicle traffic on the roadway. In accordance with one embodiment of the invention, each of the precast reinforced concrete bridge units or sections includes parallel spaced side walls integrally connected by an arcuate top wall, and the opposing inner surfaces of the side walls define a span between fifty and seventy-five feet. The arcuate top wall of each section has a radius of curvature between sixty-five and eighty feet, and the rise between the bottom surfaces of the side walls and the inner top surface of the top wall is between ten and fourteen feet. The substantially vertical outer surfaces of the side walls have a height between five and nine feet, and curved surfaces connect the inner surfaces of the side and top walls and have a radius of curvature between five and seven feet.

[0003] Other structural features and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. 1 is a perspective view of a precast concrete bridge assembly constructed in accordance with the invention and with intermediate bridge sections removed to illustrate an indefinite length for the assembly; and

[0005] FIG. 2 is an end view of each bridge section shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0006] Referring to FIG. 1, a precast concrete bridge assembly 10 includes a plurality of aligned open bottom precast concrete bridge units or sections 15 each of which is reinforced, for example, by steel rebars and/or steel mesh as disclosed in above-mentioned U.S. Pat. No. 4,993,872. Each of the one-piece bridge sections 15 includes parallel spaced side walls 18 having substantially vertical outer surfaces 17 and inner surfaces 19, and the side walls are integrally connected by an arcuate top wall 20. The span S (FIG. 2) define between the inner surfaces 19 of the side walls 18 is greater than fifty feet and less than seventy-five feet, for example, fifty-four feet or sixty feet. The rise R of each bridge section 15, as defined between the bottom surfaces of the side walls 18 and the top of an inner surface 22 of the top wall 20 is greater than ten feet and less than fourteen feet, for example, about eleven feet for a span S of fifty-four feet and about twelve feet for a span S of sixty feet. The height H of the outer surface 17 of each side wall is within the range of five feet and nine feet, for example, six feet.

[0007] The inner surface 22 of the arcuate top wall 20 of the bridge section 15 has a radius of curvature R1 which is greater than sixty five feet and less than eighty feet, for example, on the order of seventy feet. The thickness T1 of the central portion of the top wall 20 is greater than twelve inches and preferably greater than thirteen inches and less than sixteen inches, for example, fourteen inches. The arcuate top surface 23 of the top wall 20 continues with a substantially uniform radius on each side of a center reference plane P and through an angle A of about twenty-four degrees and then continues with an outer flat surface 26 having a length L2 of about three and one half feet.

[0008] The radius R1 of the inner surface 22 of the top wall 20 is uniform through an angle B of about seventeen degrees on each side of the center plane P and then continues with a smaller radius of curvature R3, for example, thirty-three feet, through an angle C of about twelve degrees. The inner surface 19 of each side wall 18 connects with the inner surface 22 at the top wall 20 by a curved surface 28 having a radius of curvature R2 greater than five feet and less than seven feet, for example, six feet. The radius R2 extends through an angle D of about sixty degrees to form a corner thickness T3 of about three feet. The lower portions of the side walls 18 have a thickness T between fifteen and nineteen inches, for example, on the order of sixteen inches to eighteen inches, and the surface 26 at each end of the top wall 20 forms a corner angle E of about 113 degrees with the outer surface 17 of the corresponding side wall 18. The projection L (FIG. 1) of each bridge section 15 is on the order of four feet.

[0009] From the above dimensions and range of dimensions for each bridge section 15, it is apparent that the radius R1 of the arcuate top wall 20 is at least five times the rise R, at least seven times the height H of the side walls 18 and at least eleven times the radius R2 of the inner curved surface 28. By constructing each underground bridge section 15 with the configuration shown in FIGS. 1 & 2 and with the angles and dimensions within the ranges set forth above, it has been found that the bridge assembly 10 provides not only for supporting the compacted soil back-filled around the bridge assembly, but also provides for a distinctive and aesthetically pleasing appearance.

[0010] While the form and profile of the bridge assembly herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not
limited to this precise form and profile and that changes may be made therein without departing from the scope and spirit of the invention as defined in the appended claims.

What is claimed is:

1. A bridge assembly comprising a plurality of one-piece precast concrete bridge sections, each of said bridge sections including substantially parallel spaced side walls having generally vertical outer surfaces, an arcuate top wall integrally connecting said side walls of each of said sections and having a generally uniform thickness, said side walls of each of said sections having opposing inner surfaces defining a span greater than fifty feet and less than seventy five feet, said arcuate top wall of each of said sections having an inner surface with a radius of curvature greater than sixty five feet and less than eighty feet, each of said concrete bridge sections having a rise defined between bottom surfaces of said side walls and a top inner surface of said arcuate top wall greater than ten feet and less than fourteen feet, and each of said side walls of each of said sections having an outer surface with a height greater than five feet and less than nine feet.

14. A bridge assembly as defined in claim 13 wherein each of said bridge sections has an inner curved surface connecting an inner surface of said arcuate top wall and an inner surface of each of said side walls, and said curved surface has a radius of curvature greater than five feet and less than seven feet.

15. A bridge assembly as defined in claim 13 wherein each of said bridge sections has opposite end surfaces defining a length less than one tenth of said span.

16. A bridge assembly as defined in claim 13 wherein said arcuate top wall of each said bridge sections has a radius of curvature greater than five times a rise defined between bottom surfaces of said side walls and a top of said inner surface of said top wall.

17. A bridge assembly as defined in claim 13 wherein said radius of curvature of said top wall is greater than seven times a height of substantially vertical outer surfaces of said side walls.

18. (canceled)

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