

STRUCTURE SELECTION

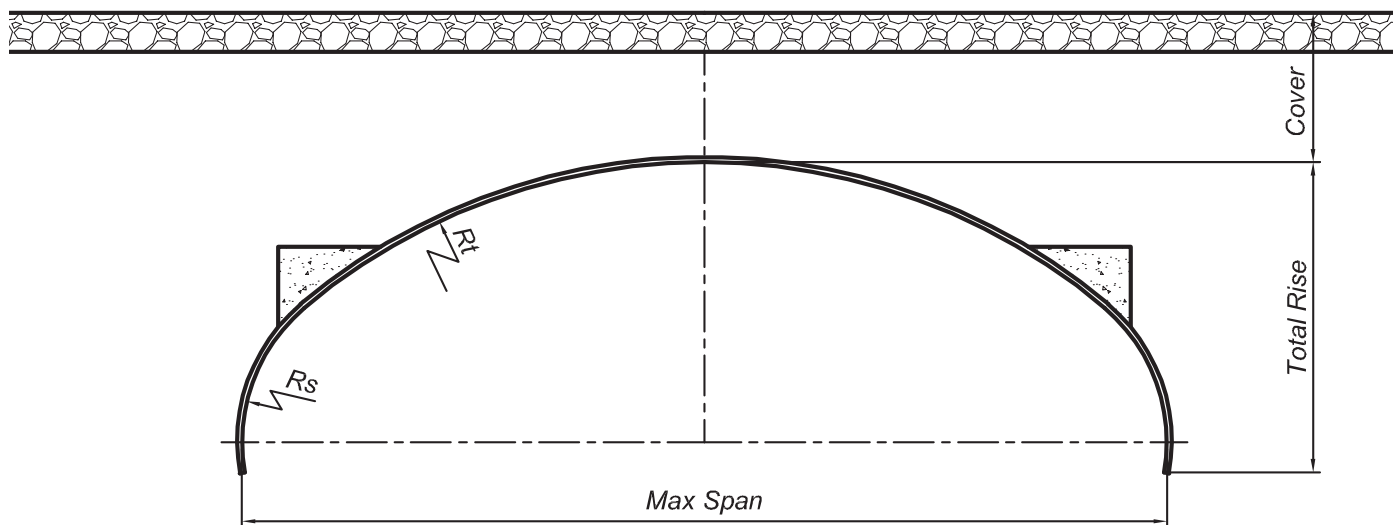


Figure 1 – Basic nomenclature

Selecting the Optimum Shape and Size

With the variety of CONTECH Structural Plate shapes and sizes available, there can be several possible structures that provide the necessary service function. However, economics and performance can often be improved by selecting the best Structural Plate shape and size for the application and site conditions.

The standard shapes available are summarized in the CONTECH Structural Plate Design Guidelines (SPDG).

Special shapes are also available to meet specific site conditions and performance criteria.

Establishing Basic Type, Size and Location

The Engineer of Record must determine the project requirements such as hydraulic flow, allowable water elevations, elevations for grade separations, clearance diagrams, foundation bearing capacity, grade and alignment. With this information, CONTECH can assist in selecting the overall most economical shape and size.

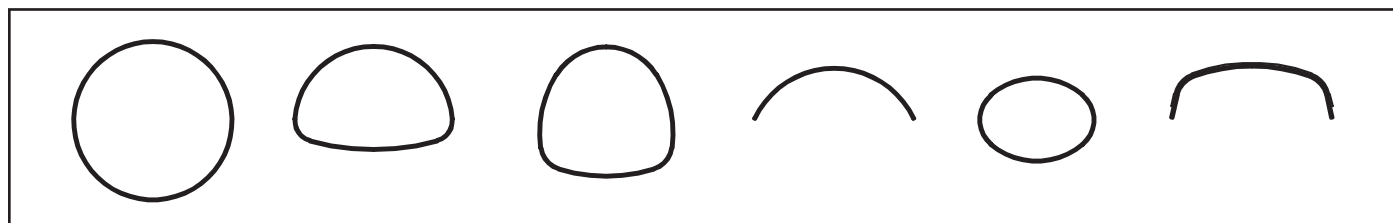


Figure 2 – Round, Pipe Arch, Underpass, Arch, Ellipse, Box Culvert

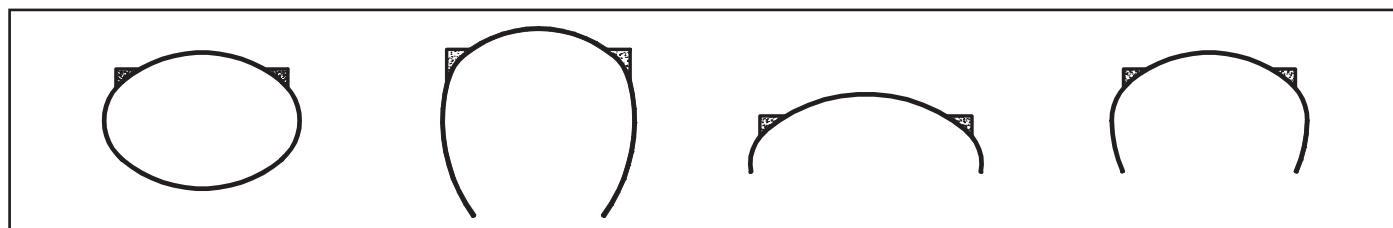
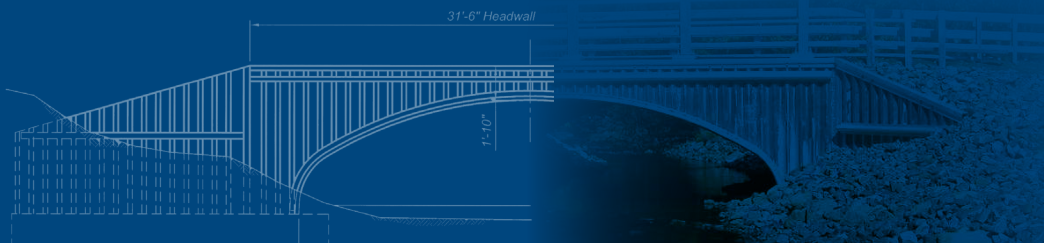


Figure 3 – Long span: Ellipse, Pear Arch, Low Profile Arch, High Profile Arch



STRUCTURAL PLATE

TECHNICAL BULLETIN NO. 1

Items to consider are:

1. Standard shapes from the SPDG are generally preferred.
2. Gauge and minimum cover is generally controlled by the structure top radius, R_t . In general, structures with a small R_t are the most economical.
3. The minimum cover listed in the SPDG provides the most economical gauge for a particular live load.
4. The "fit" of clearance diagrams should allow for structure movement during installation. Typically the clearance diagram should allow for -2% dimensional shape change at any given point.
5. Structures with a full invert can be partially buried to provide a natural bottom.
6. Arches can be placed on a pedestal footing or parapet to accommodate specific clearance box dimensions or enhance hydraulic flow.
7. Selecting a pipe arch, underpass, ellipse or pear to avoid soft soil conditions is an unacceptable practice (see Tech Bulletin #2, "Foundation Bearing Strength and Settlement"). While these structures do eliminate the cost of footings, they do not correct or compensate for problems associated with soft soils.
8. Long-span structures requiring installation at minimum cover should include a nominal 2% allowance for an increase in the rise during backfill. A structure with a shape factor in the range of $2.9 \leq R_t/R_s \leq 3.75$ is preferred.
9. Long-span structures with cover of 10 feet or more should have a shape factor $R_t/R_s < 3.0$ to minimize bearing pressure of the side plates against the backfill.
10. Long-span structures with multiple radii are typically limited to a maximum cover of 20 feet. Actual maximum cover will depend on shape, plate gauge, backfill material and compaction.
11. The most economical structure may not be the one with the lightest gauge or least $P_i (N)$ in its perimeter. An oversized shape with full invert, buried slightly, many times will be more economical than construction of an arch on cast-in-place concrete foundations.
12. Selection of an aluminum box culvert is normally made for locations with standard highway live loads and a typical range of cover between 1.4 to 5.0 feet.