

## **REINFORCED CONCRETE BOX (RCB) VS. CAST-IN-PLACE ARCH (CIP ARCH) INSTALLATION CONCERNS**

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When comparing RCB to CIP Arch several factors should be considered including design, hydraulic efficiency, installed cost, quality control, risk and installation time. This Info Brief focuses on the comparison relative to installation concerns.

Since CIP Arch is constructed in the field the trench must be open until construction of the structure is complete and concrete has achieved sufficient strength. This extended time period exposes the project to costly construction time and hazardous open trenches. Additional costs are required for stabilization of the open trench to provide a safe environment for workers who must construct forms, place and tie steel and pour concrete for the construction of the arches within the trench.

Installation of RCB is faster, safer, and less expensive than installation of CIP Arch. Since RCB's are manufactured at a plant facility, they arrive at the jobsite ready to install. The installation of the box sections can be completed the same day they arrive on the jobsite eliminating the need to leave the trench open. The project is completed much faster saving construction days and dollars.

Installation cost of RCB is further reduced compared to CIP Arch since the structure is smaller and requires less excavation to install. No excavation is required to make room for concrete forms as is the case with CIP Arch.

Additionally, bedding and select backfill requirements are less expensive for RCB's than CIP Arch structures. The arch design is relatively more dependent upon side soil support resulting in more select backfill and critical compaction requirements compared to typical RCB installations.

## INSTALLATION COST COMPARISON

	<b>RCB</b>	<b>CIP Arch</b>
<b>Excavation</b>	No extra trench width needed for forms and construction. Can be designed for minimum to no cover to reduce depth of installation. <b>LESS COST!</b>	Extra excavation required to accommodate: <ul style="list-style-type: none"> <li>• Forms</li> <li>• Construction safety for extended open trench time</li> <li>• Extra select fill for side soil support critical to arches</li> <li>• Extra depth to allow sufficient soil cover</li> </ul>
<b>Bedding</b>	Typical bedding required is 6 inches prepared base. <b>LESS COST!</b>	Bedding typically required is 12 inches prepared base.
<b>Side Support</b>	Typical side support involves 12 inches select backfill compacted to 90% dry density. <b>LESS COST!</b>	Typical side support involves 2 feet of select backfill compacted to 90% dry density.
<b>Cover</b>	Can be designed for as little as no required cover. <b>LESS COST!</b>	Typically requires select backfill 12 inches thick.
<b>Trench Opening</b>	Trench opening minimized and can be opened and closed the same day. <b>LESS RISK!</b>	Wider trench for wider structure and to accommodate forms. Trench must remain open for extended periods.

## INSTALLATION CONCERNS

	<b>RCB</b>	<b>CIP Arch</b>
<b>Open Trench</b>	RCB boxes can be installed and covered the day they arrive. <b>LESS RISK!</b>	CIP Arch trenches are left open until forms placement, steel placement, concrete placement and curing are complete. Can take weeks.
<b>Quality of Product</b>	Manufactured in controlled plant conditions per ASTM specifications, delivered to jobsite complete and ready to install. <b>CONSISTENT HIGH QUALITY!</b>	Construction in open environment. Exposed to the elements. Proper steel placement and concrete quality affected by elements and jobsite conditions.