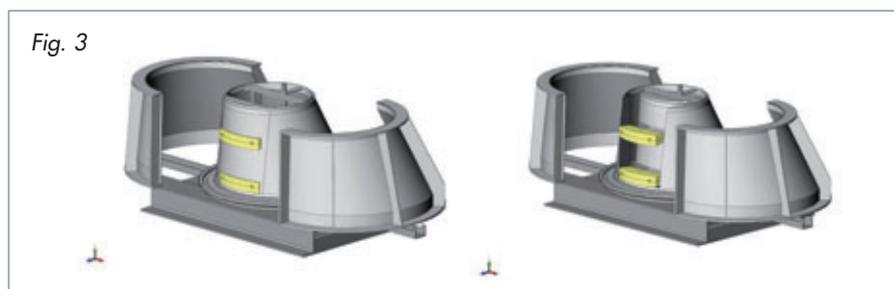
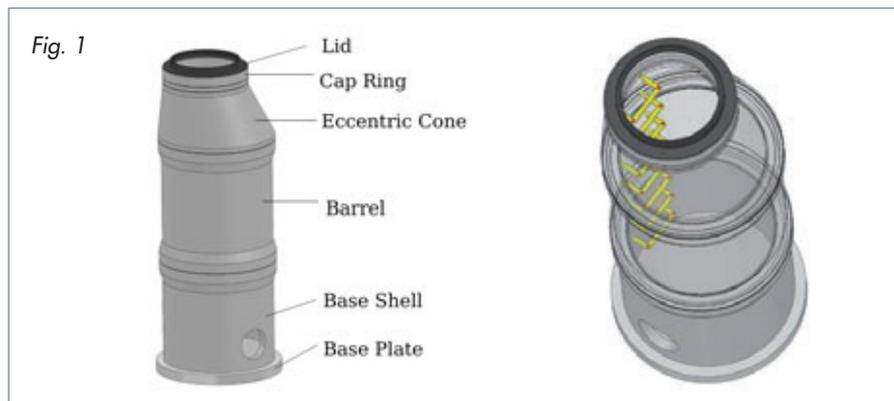


Toyota Kohki Co., Ltd., Tokio, 183-0035 Japan

Types of manholes used in Japan

Toyota Kohki Co., Ltd. is a mould manufacturer for precast concrete products and related manufacturing equipments. Since its establishment in 1966, Toyota Kohki has been contributed to the development of the concrete industry as a leading mould manufacturer in Japan. Technologies innovated by Toyota Kohki are able to provide customers with high quality, precise, durable, efficient, and easy-to-use moulds, and has got high opinions from customers around the world.



The topic in this issue is manhole products focusing on types of manholes used in Japan, the methods of manufacturing, and Toyotaforms' contribution to the product development. The pictures shown in Fig. 1 are manholes which is one of the most important precast concrete products for sewerage construction. There are mainly two ways to manufacture manholes in Japan; (1) wet-cast concrete manhole, and (2) dry-cast concrete manhole. In this issue, the mould technology for wet type manhole which is a mainstream product in Japan is introduced.

It is widely known that the wet-cast concrete manholes have higher operational flexibility on construction sites. The products are

divided into the following parts: base plate, base shell, barrel, eccentric or concentric cone, cap ring, and lid (See Fig 1). The wet-cast manholes are designed and manufactured in handleable weight in order to be constructed by small lifting equipment. Steps are the indispensable item for manhole products for inspection. There are two ways to install the steps on the manhole wall; (1) Cast-in Step and (2) Set-in Step. "Cast in step" is a way to cast the steps into the concrete products when manufacturing products whereas "Set-in Step" is a way to set the steps after demoulding.

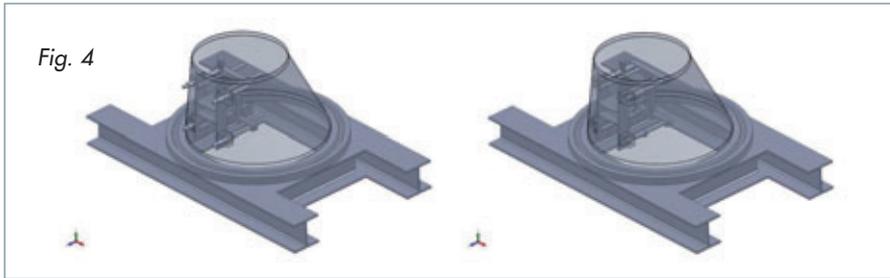
Normally it is more difficult and takes more time to manufacture the "Cast-in step" man-

hole than Set-in step one. As shown in Fig. 2, windows in the inner core of the mould are necessary for setting the Cast-in steps. After cleaning the mould and before pouring concrete, first put the step onto the opened-window, and then close the window by bolting up the window-plug parts. It is tough and physically taxing job to do the operation above for pouring each time because operators have to work inside the narrow inner core, especially a high mould. In addition, the operation of removing the windows is required before demoulding. The operation improvement for Cast-in step manhole product has been strongly anticipated by operators because of the reasons above.

Toyota Kohki engineers developed innovative technologies and provide moulds which dramatically improve the operation efficiency by enabling to operate from outside of the mould. The technologies can be adapted to both the cone and barrel mould, and the moulds are all gasketed with sealing rubber to prevent it from leaking. Comparing to "Cast-in step" manhole, only the holes are needed when manufacturing "Set-in step" manhole products for setting the steps after demoulding. Fig 4 show one type of the manhole mould made by Toyota Kohki, which is one-touched mechanical clamp system for open and close the holes parts easily.

To manufacture the concrete products integrated with base floor such as a drain inlet or a base shell, traditionally taper of the inner core is necessary for demoulding. Toyotaforms made it possible to make these moulds with straight wall and no taper for the inner core. The inner core is collapsible by one-touched system and can be opened and closed easily by hand from the outside of the mould.

Only a handle tool is required for this operation instead of using hydraulic or electric devices. The manholes with straight wall allow producing any different heights by adjusting the same base pallet. Moulds for "Set-in step" manholes are all gasketed with sealing rubber for leakage protection as well. Toyotaforms' one-touched mechanical clamp system facilitates the easy open-close operation of hole-parts.



try. With the years of experiences and know-how, Toyota Kohki can offer customers the best solution for meeting individual customers' demands in precast moulds.

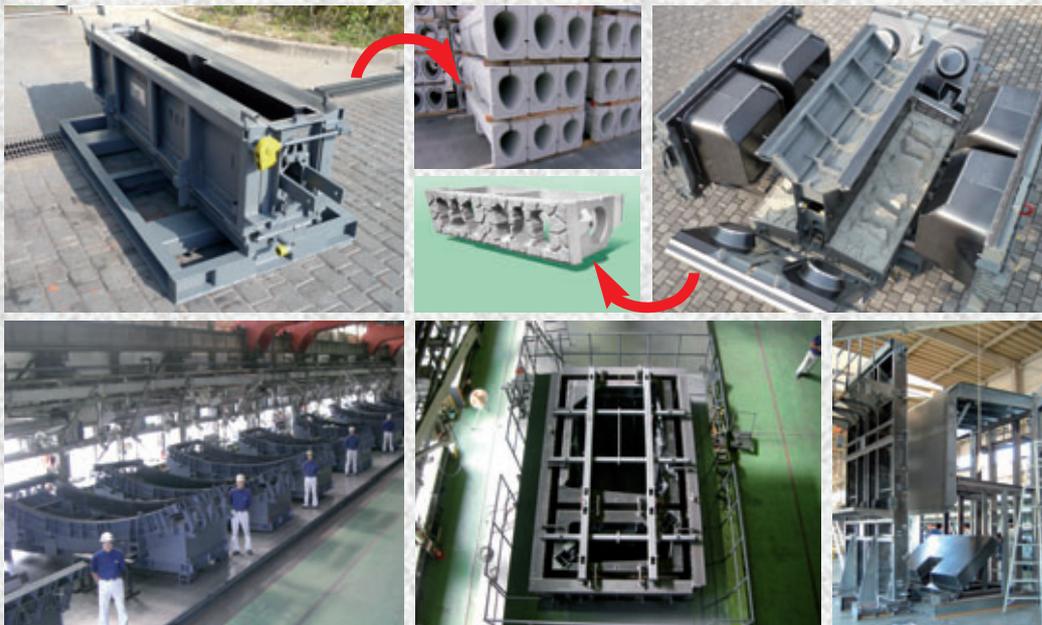
FURTHER INFORMATION



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As introduced, both "Cast-in step" and "Set-in step" manholes have been manufactured in Japan and variety types of concrete products for sewages have been continuously constructed. It is not an exaggeration to say that the actual efficiency, quality, and pre-

ciseness of concrete products are determined by the quality and technologies of moulds. The innovative ideas and design skills are the basis of Toyotaforms. Since 1966, Toyota Kohki has made tens of thousands of moulds used in the precast concrete indus-



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