

Description – Constructions for shortening of towing tank

10 General information

Today's towing tank will be shortened in connection with the project «Ocean Space Centre». The towing tank including the superstructure must be demolished from approx. Axis 14+. The demolition is described in a separate chapter.

After the eastern part of the towing tank has been demolished, a new end wall shall be established in the tank, located in axis 14. The wall will be as high as the depth of the tank. Water pressure on the tank is intended to be taken up with shear dowels for existing tank walls and tank floors.

In the tank, a platform with two levels will be built. The platform that is included in the new end wall will be the foundation for wave generation machines that will be delivered in a separate user equipment contract. A light steel building with climate walls / roof will be built above the tank. The steel structure is placed on existing concrete structures and on a new tank wall. Climate walls must satisfy insulation requirements given in TEK17 and have two-stage sealing. A trolley beam shall be fitted to the steel structure.

In general, the final choice of user equipment will provide the prerequisites and premises for design and final design and execution.

Furthermore, it is the responsibility of the chosen turnkey EPC contractor to make the necessary measurements on site.

20 Construction work in general

Assumptions and dimensioning criteria

All design and execution of building and construction shall be carried out in accordance with public laws and regulations.

For new tank wall and load-bearing structure in superstructure, the following applies in particular:

- Eurocode Standards with national supplements (NS-EN) included in the Eurocode program for load-bearing structures
- Norsk standard NS 3420 (for utførelse)
- NS-EN 13670-2008+NA Utførelse av betongkonstruksjoner
- NS-EN 1090-2 Utførelse av stålkonstruksjoner
- NS-EN ISO 12944 Korrosjonsbeskyttelse av stålkonstruksjoner
- Byggdetaljblader og Byggforsk

Basis for this chapter consists of:

- Architectural drawing of facade and plan.
- Schematic diagram of new constructions, drawing C-00-B-20-50-001

The structures must be dimensioned in their entirety for a service life of at least 10 years. The water in the tank may contain chlorides. Concrete construction must therefore be designed for exposure class XD2. Steel structures shall be corrosion protected so that they satisfy the requirements given for corrosion category C4 according to table 1 in NS-EN ISO 12944-2.

It is assumed that the steel structures are finished with knot plates, foot plates, stiffeners, etc. mounted, so that welding on the construction site is minimized. The steel structures must be delivered fully corrosion-protected from the workshop.

Deflection requirements

Beams, decks, TRP boards and sandwich elements in the facades must not have a greater deflection than $L / 300$, and a maximum of 25 mm. The trolley beam must in addition satisfy the current requirements for displacements given in NS-EN 1993-6; «Design of steel structures, Part 6: Crane tracks».

Fire insulation / fire resistance

Load-bearing structures shall be fire-insulated with the necessary boards, fire-painting or covering to the fire class specified in the fire strategy documents.

Tolerances

For tolerances, what is stated in the current edition of NS 3420 under Part 1 Common provisions, Tolerances for buildings, applies. Tables 1, 2 and 3 shall form the basis for normal requirements for tolerances for surfaces in / on buildings ready for use and flatness tolerances. In addition, separate stricter requirements apply in the individual NS-EN for the execution of concrete structures, steel structures, etc and for some of the professional chapters in NS 3420.

Tabell 1 - Normalkrav til toleranser for overflater i og på bruksklare bygninger

Type toleranse	Yttervegg (23)		Innervegg (24)	Dekke (25)		Yttertak (26)		Trapp, balkong (28)		
	Utv. kledn., overflate (235)	Innv. Kledn., overflate (236)	Kledning overflate (246)	Gulv (255)	Himling (256)	Tekking (262)	Himling, overflate (266)	Innv. trapp (281)	Utv. trapp (282)	Balkong, veranda (284)
Retning	RD	RC	RC	RB	RC	RD	RC	RB	RC	RC
Planhet	PD	PC	PC	PB	PC	PD	PC	PB	PC	PC

21 Ground and foundations

This chapter only applies to the shortening of the towing tank with associated superstructure. Existing tank bottom and walls are used as a foundation for the superstructure and a new end wall. Demolition and preparation of the tank for this construction is described in the demolition chapter of the main project.

22 Main structure

Assumptions and dimensioning criteria are given in Chapter 20.

New tank wall is to be casted waterproof. The water pressure on the wall is taken up by the wall and anchored to the long wall of the tank and to the bottom plate of the tank. It is proposed to fasten the shear dowels to existing concrete structures, as well as to lay swelling bands and injection hoses in casting joints. The wall shall be dimensioned and designed so that it satisfies «Tightness class 1», ref NS-EN 1992-3 table 7.105. The turnkey EPC contractor is responsible for the correct dimensioning and correct execution so that this is tight enough.

In the tank, a platform will be created, divided into 2 levels. The platform will be the foundation for the new wave generation machines. Load from wave machine depends on the supplier and will be available when contracting the turnkey EPC contractor. The platform is presumably made up of steel

columns, steel beams and casted TRP plates. The platform is also expected to be supported at steel angles bolted to the tank walls. This structure is permanently immersed in water which may contain chlorides.

A superstructure with columns on tank walls will be built above the tank. The roof construction is proposed to be made with self-supporting TRP boards laid on 4 HE-beams. The HE beams are located on columns in axis 14+ and on bolted brackets in the existing concrete wall axis 14 + 6m. New columns are placed on a new tank wall, as well as on the outside of the existing tank wall. The bracing of the building is proposed to be done with 3 bracing crosses, one in each facade, the roof acts as a rigid slab. The turnkey EPC contractor must include and is responsible for dimensioning all necessary fastening details, foot plates, bolts, end plates, etc. for a complete construction.

Under the roof of the extension, a trolley beam will be established. The trolley must have a lifting capacity of at least 4 tonnes. The trolley beam is proposed to be attached to the roof beams. The trolley itself shall be delivered by the turnkey EPC contractor. The distance from the water level in the tank to the lower edge of the trolley beam must be at least 5.2 m.

221 Columns

6 new steel columns shall be delivered. 4 steel columns for the new concrete wall, 2 on an existing tank wall. Where the columns are part of the horizontal bracing, there may be a need for tension anchoring of the columns. The use of cold-formed hollow profile columns has been proposed. The columns can be mounted bolted to the concrete structure, possibly welded to embedded slabs at the top of the new tank wall if the turnkey EPC contractor thinks this will be a better solution.

222 Beams

It is assumed that HE and IPE beams will be used in the extension. The beams shall be a support for corrugated steel sheet roof. 4 roof beams have been proposed, in addition to 2 edge beams. The roof beams must also support a trolley beam. The beams shall carry a general snow load with associated snow form in addition to the applied dead weight from the ceiling / insulation / roofing and load from the crane.

223 Reinforcing structures

Stiffening constructions in the form of vertical crossings between the steel columns are provided. If the contractor finds it more appropriate, oblique tension pressure rods can alternatively be used. The bracing is part of the load-bearing structure and must be fire-insulated and corrosion-protected in the same way as for beams and columns.

It is assumed that the roof acts as a rigid slab.

23 Exterior walls

New tank wall is described above. It is assumed that insulated sandwich elements in steel are used as facade elements. It is intended that the elements be attached to steel columns. The facade is part of this delivery. All connections to existing walls / decks and to ceilings and floors must be included in the delivery. The wall elements must withstand the stress given in relevant standards.

24 Interior walls

There is no need for interior walls in this part of the building / this chapter.

25 Covers

There is no need for new casted decks beyond platforms described in Chapter 22 «Support system». The roof is described in chapter 26 «Exterior roof».

26 Exterior roof

The external roof is assumed to be made with corrugated steel plates laid on HE / IPE beams. The roof must be insulated and covered according to normal practice. The roof is established with a one-sided slope. Gutters and roof downspouts must be installed. Roof water is led in closed pipes down and out onto the terrain. Connections to existing structures and new roof structures shall be included. The roof must be covered with suitable asphalt cardboard in a color specified by the architect.