INSPECTION OF NFT-TYPE CASK FABRICATION

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SUMMARY

NFT-type cask has been developed to transport the high burn-up spent fuel from Japanese nuclear power stations to the reprocessing plant of Japan Nuclear Fuel Limited which is under construction in Rokkasho-mura, Aomori prefecture.
NFT placed orders of 53 casks to 5 fabricators in Japan and overseas , and these casks have been fabricated since 1994.

There are two types of NFT-type casks for PWR spent fuel and four types of NFT-type cask for BWR spent fuel. These are designed in consideration of the number of spent fuels accommodated into each type of casks and the handling conditions at domestic nuclear power stations.

According to Japanese notification , it is required to be confirmed by competent authority that casks are manufactured in accordance with approved designs.
Furthermore , additional tests are performed such as through-gauge test for basket and pressure test on the shielding material space to ensure the performance of cask by NFT other than items inspected by the competent authority.
In order to enhance maintainability of casks , replacement parts such as bolts and valves are shared as much as possible.

OUTLINE OF NFT-TYPE CASK

There are two types of NFT-type casks for PWR spent fuel and four types of NFT-type casksfor BWR spent fuel. The structures of these casks are almost the same except for outer diameters which depend on the number of spent fuels accommodated into each type of casks.
Specifications of each NFT-type cask are shown in the TABLE-1. For example , the configuration of NFT-14P cask is shown in FIGURE-1

INSPECTION FOR NFT-TYPE CASK

In order to verify that casks are fabricated in accordance with the approved designs based on the causes prescribed in Japanese regulation , NFT inspects casks and submit inspection records to the competent authority after the completion of cask fabrication .

Therefore , inspections described at a chapter "Methodology of test and inspection" of Safety Analysis Report (SAR) should be carried out during and after fabrication of cask , for the purpose that NFT-type casks are fabricated to satisfy the design conditions .

INSPECTION ITEMS DESCRIBED IN SAR

Inspection items described in the SAR of NFT-type cask are shown in Table-2. The major inspection items are chosen to be confirmed that casks are fabricated in conformity with their design conditions such as structural strength , thermal dissipation , containment , shielding and criticality described in SAR.

Handling test and appearance inspection are carried out to confirm that function of cask parts is acceptable after the completion of the cask.

INSPECTION PERFORMED BY NFT

53 NFT-type casks have been fabricated , same inspections are performed on the every cask. Casks are inspected by the competent authority after inspections by fabricators and by NFT are completed and the results are accepted.

Inspection items and methodologies (Inspect in the presence or Inspection by records) which should be carried out by fabricators and by NFT were determined according to their importance.

ADDITIONAL INSPECTIONS BY NFT

NFT carries out additional inspections as follows in order to confirm the performance of 53 casks during fabrication.

- GO-gauge and NO-GO gauge for screw-thread (screw and screw hole greater than or equal to M12)
- Resin installation (neutron shielding part)
- Welding of internal fin (fins between middle shell and outer shell)
- Through gauge test for basket (basket channel)
- Function test during water level adjusting (basket guide pipes etc.)

- Confirmation of volume of cask cavity (cask body)
- Confirmation of welding operation (all parts of weld)

Some description of additional inspections mentioned above are as follows.

(1) Through gauge test for basket

Basket is used to load spent fuels into cask and not to make fuel assemblies breakup or gather ,at the same time to maintain spent fuels in condition of subcriticality.

It is confirmed that internal dimensions of basket channels are within the design range with 3 kinds of gauges as follows.

- Through gauge

  This gauge simulates the actual fuel assembly and is used to confirm that fuel assemblies can be loaded smoothly into baskets.

- Cross section through gauge

  This gauge is used to confirm that the minimum dimension of channel is ensured.

- No-Go gauge

  This gauge is used to confirm that the maximum dimension of channel is ensured.

(2) Pressure test and leak test

Casks fabricated in conformity with approved design is mandatory to be inspected periodically more than one time every 10 times in use or more than one time a year.

Therefore , in order to enhance maintainability of casks in future , pressure tests are performed on the parts other than parts described in SAR shown in Table-3.

SHARING OF REPLACEMENT PARTS

In order to enhance maintainability of 6 types of NFT casks , replacement parts such as bolts and valves are shared as much as possible. By sharing parts , the number of parts which shall be controlled and shall be inspected is reduced . Therefore , workability of replacement part become enhanced during cask maintenance required by the regulations.

Replacement parts are shown in Table-4.

TABLE - 1 SPECIFICATIONS OF NFT-TYPE CASKS

TYPE	NFT-14P	NFT-10P	NFT-38B	NFT-32B	NFT-22B	NFT-12B
PACKAGE WEIGHT (approx. ton)	115	84	119	106	98	74
OVERALL LENGTH (approx. m)	6.3	6.2	6.4	6.4	6.3	6.4
OVERALL DIAMETER (approx. m)	2.6	2.6	2.6	2.4	2.6	2.3
PACKAGING WEIGHT (approx. ton)	102	75	103	93	88	68
TYPE OF FUEL	PWR SPENT FUEL		BWR SPENT FUEL			
N^0 OF FUEL ASS'Y	14	10	38	32	22	12

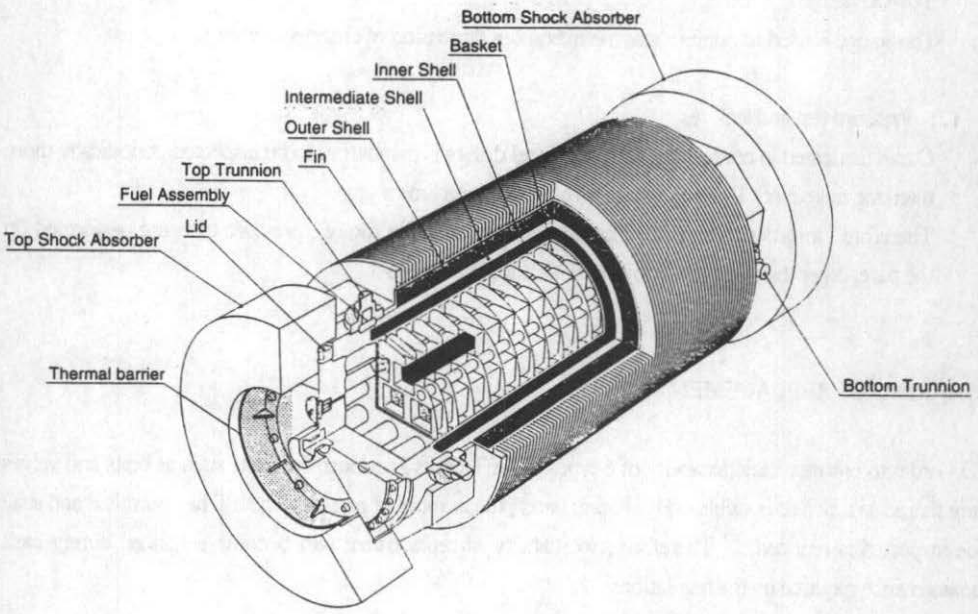

FIGURE-1 CONFIGURATION OF NFT-14P TYPE CASK

TABLE-2 INSPECTION ITEMS OF NFT TYPE CASK

No.	ITEMS	NOTE
1	MATERIAL INSPECTION	
2	DIMENSION INSPECTION	
3	WELDING INSPECTION	EDGE PREPARATION , APPEARANCE, P.T. M.T. , R.T.
4	APPEARANCE INSPECTION	
5	PRESSURE TEST	
6	LEAK TEST	
7	SHIELDING FUNCTION INSPECTION	γ RAY AND NEUTRON SHIELDING PERFORMANCE
8	SHIELDING DIMENSION INSPECTION	γ RAY AND NEUTRON SHIELDING DEMENSION
9	THERMAL TEST	
10	LIFTING LOAD TEST	
11	WEIGHT INSPECTION	
12	SUBCRITICALITY INSPECTION	
13	FUNCTION TEST	
14	HANDLING TEST	

TABLE-3 PRESSURE TEST AND LEAK TEST

ITEMS		INSPECTION PART
PRESSURE TEST		• SHOCK ABSORBING COVER • SHIELDING MATERIAL SPACE • VALVE
LEAK TEST	HELIUM LEAK TEST	• VALVE SEAL
	PRESSURE DROP METHOD OR PRESSURE INCREASE METHOD	• SPACE BETWEEN TRUNNION O-RING AND CASK BODY • O-RING SEALS AT FUSIBLE PLUG • SEALS OF LEAK CHECK PLUG FOR TRUNNION

TABLE-4 SHARING OF REPLACEMENT PARTS

PARTS	SHARING
WATER LEVEL CONTROL PURESSURE VALVE	COMMON FOR ALL CASKS
VENT / WATER LEVEL CONTROL VALVE	COMMON FOR ALL P-TYPE CASKS , COMMON FOR ALL B-TYPE CASKS
DRAIN VALVE	COMMON FOR ALL P-TYPE CASKS , COMMON FOR ALL B-TYPE CASKS
LEAK TEST HOLE OF LID	COMMON FOR ALL CASKS (EXEPT TYPE 12B)
LID BOLT & WASHER	COMMON FOR ALL CASKS
LID ORIENTATION PIN	COMMON FOR ALL CASKS
TRUNNION BOLT	COMMON FOR ALL CASKS
TRUNNION O-RING	COMMON FOR ALL CASKS
TRUNNION	COMMON FOR ALL P-TYPE CASKS , COMMON FOR ALL B-TYPE CASKS (EXEPT TYPE 12B)
SHOCK ABSORBER BOLT & WASHER	COMMON FOR ALL CASKS
LID PINTLE & LID PINTLE BOLT	COMMON FOR ALL CASKS
SHOCK ABSORBER LIFTING LUG	COMMON FOR ALL CASKS
FUSIBLE PLUG	COMMON FOR ALL CASKS