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Design and Structural Safety Evaluation of Canister for Dry Storage System of PWR Spent Nuclear Fuels

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The aim of this study is to ensure the structural integrity of a canister to be used in a dry storage system currently being developed in Korea. Based on burnup and cooling periods, the canister is designed with 24 bundles of spent nuclear fuel stored inside it. It is a cylindrical structure with a height of 4,890 mm, an internal diameter of 1,708 mm, and an inner length of 4,590 mm. The canister lid is fixed with multiple seals and welds to maintain its confinement boundary to prevent the leakage of radioactive waste. The canister is evaluated under different loads that may be generated under normal, off-normal, and accident conditions, and combinations of these loads are compared against the allowable stress thresholds to assess its structural integrity in accordance with NUREG-2215. The evaluation result shows that the stress intensities applied on the canister under normal, off-normal, and accident conditions are below the allowable stress thresholds, thus confirming its structural integrity.

Keywords: Canister, Spent nuclear fuel, Dry storage module, Confinement boundary

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1. Introduction

The purpose of the canister is to transport and store spent nuclear fuel from the wet storage pool of a nuclear power plant to a dry storage facility. Once loaded with spent nuclear fuel in wet repositories, the canister undergo multiple sealing processes, involving the closure of canister lids, primary welding, and the installation of sealing rings followed by secondary welding. The canister is then subjected to dehumidification to remove the internal residual water and transition into a dry environment. By utilizing dedicated transfer cask, the canister is relocated to Dry Storage Modules (DSMs) for storage. A dry storage module consists of a modular structure, which is a concrete structure, and a storage cylinder where the canister is stored. As the structural integrity of the canister under transfer conditions is assessed during the evaluation of transfer cask, the primary objective of this study is to design the canister suitable for storage conditions within the DSM and to ensure its reliability through an evaluation of its structural integrity based on code requirements. To evaluate the structural integrity of the designed canister, the load application criteria of the structural analysis were based on the confinement boundary and internal components of the canister, which was then assessed under normal, off-normal, and accident conditions.

2. Specifications of the Canister

The canister consists of a stainless steel-based cylindrical outer shell, a baseplate, and a lid. The canister is sealed and welded for confinement once it is loaded with spent nuclear fuel and is located inside a modular storage cylinder structure. The body of the canister measures 4,890 mm in length and 16 mm in thickness. With a diameter of 1,708 mm and length of 4,590 mm for the inner cavity, a basket assembly and a support structure for the spent nuclear fuel are located inside the canister. The canister weighs 8.92 ton and the total weight including the internal components is 39.2 ton.

The internal components can accommodate 24 bundles of spent nuclear fuel and consists of the basket assembly, positioner, spacer, and frame. The basket assembly is made of stainless-steel plates in a quadrangular tube form to house the nuclear fuel assemblies, where each cell is flanked by borated aluminum plates, consisting of boron (B_4C). Spacers are located between the baskets to maintain a gap and 20 horizontal frames surround the baskets from the outside. A schematic diagram of the canister in this study is shown in Fig. 1.

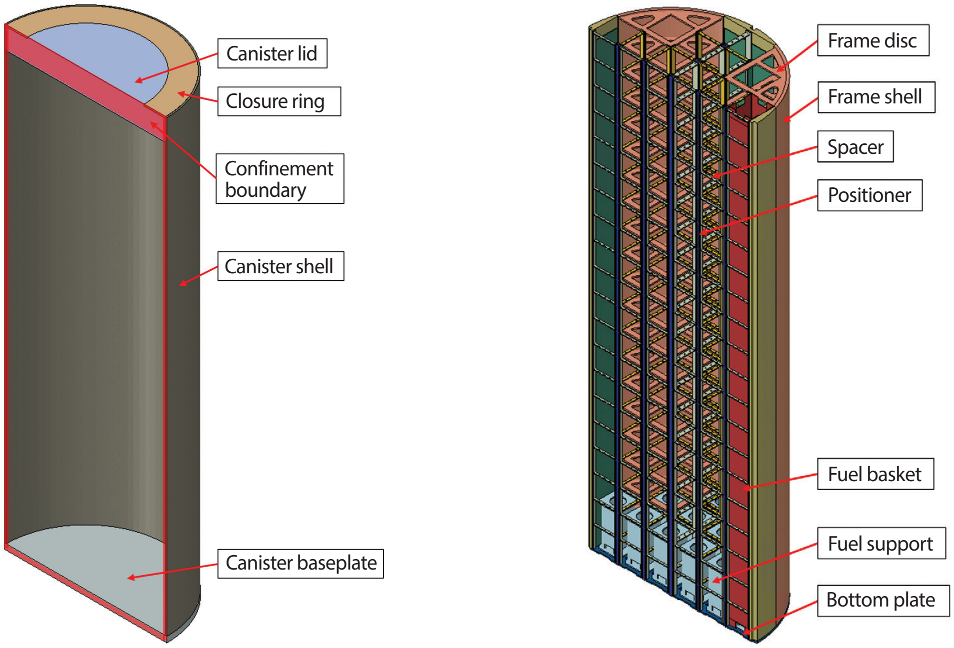
3. Design Criteria

The canister inside the modular storage structure must maintain its performance for criticality and confinement, without compromising any of its main safety features under all normal, off-normal, and accident conditions. Among the functions of the canister, confinement is the most critical. The technical standards and design criteria of the canister are categorized into normal, off-normal, and accident conditions, as shown in Table 1.

To perform a stress evaluation of the canister, load combinations were produced according to NUREG-2215 standards, based on the structural analysis results for each load [3]. The load combinations are categorized according to normal, off-normal, and accident conditions, as shown in Table 2.

4. Allowable Stress

The confinement structure of the canister is maintained by the baseplate, shell, lid, port covers, and welds. After loading the spent nuclear fuel within the canister, the lid and sealing ring are sealed and welded for confinement, and then the canister is placed within the modular structure. The welds



(a) Canister (b) Inner components

Fig. 1. Schematic diagram of the canister.

Table 1. Design criteria of the canister

	Type	Criteria	Basis
Normal conditions	• Ambient temperature	33.3℃	NUREG-2174 [1]
	• Dead load	Self-weight	-
	• Handling load	115% of self-weight	ASME NOG-1 [2]
	• Pressure	1% fuel rod rupture	NUREG-2215 [3]
Off-normal conditions	• Ambient temperature	−15.6/36.6℃ (min/max)	NUREG-2215
	• Pressure	10% fuel rod rupture	NUREG-2215
	• Block	50%	10CFR72.128(a)(4) [4]
Accident conditions	• Ambient temperature	41℃	NUREG-2215
	• Pressure	100% fuel rod rupture	NUREG-2215
	• Seismic	0.3 g (horizontal/vertical)	RG 1.60, 1.61 [5, 6]
	• Block	100%	10CFR72.128(a)(4)
	• Fire	6 min/800℃	-

between the canister shell and lid as well as the lid and port covers become the primary confinement boundary welds and the sealing ring maintains the secondary confinement. The confinement boundary of the canister is shown in Fig. 1(a).

The allowable stress intensities of the confinement structure under normal and off-normal conditions are specified in ASME B&PV Code, Sec. III, Div.1, Subsec. NB, while the requirements in ASME B&PV Code, Sec. III,

Table 2. Load combinations of the canister

Load combination	Dead load	Handling load	Pressure	Thermal	Earthquake
Normal condition					
LC.1	D		P	T	
LC.2	D	H	P	T	
Off-normal condition					
LC.3	D		P	To	
LC.4	D	H	Po	To	
Accident condition					
LC.5	D	H	Po	Ta	
LC.6	D		Po	T	E
LC.7	D		Po	T	
LC.8	D	H	Pa	To	

D: Dead load
H: Handling load
P: Normal pressure
Po: Off-normal pressure
Pa: Accident pressure
T: Normal thermal
To: Off-normal thermal
Ta: Accident thermal
E: Earthquake

Table 3. Allowable stress intensities of the confinement boundary

Stress intensity	Allowable stress		
	Normal condition	Off-normal condition	Accident condition
Primary membrane Pm	1.0 Sm	1.1 Sm	Min (2.4 Sm, 0.7 Su)
Primary membrane and primary bending Pm+Pb	1.5 Sm	1.65 Sm	Min (3.6 Sm, 1.0 Su)
Membrane and primary bending and secondary Pm+Pb+Q	3.0 Sm	3.3 Sm	N/A

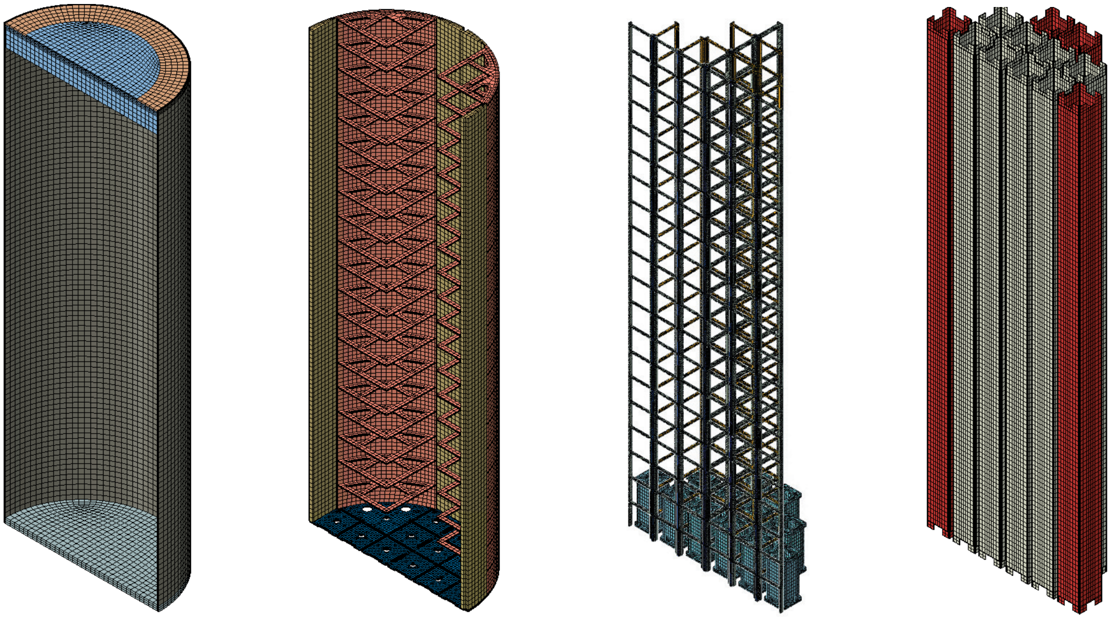
Su = Tensile strength
Sy = Yield strength
Sm = Design stress intensity
Pm = Membrane stress is the component of normal stress that is uniformly distributed and is equal to the average stress across the thickness of the section under consideration.
Pb = Bending stress is a component of normal stress that varies across the thickness.
Q = Secondary stress is a normal stress or a shear stress developed by the constraint of adjacent material or by self-constraint of the structure. (ex. (a) general thermal stress (b) bending stress at a gross structural discontinuity.)

Div.1, App F are applied for accident conditions. The allowable stress intensities are summarized in Table 3 [7, 8]. The allowable stresses for the canister were calculated under normal, off-normal, and accident conditions, considering the actual temperatures. While the shell and baseplate of the canister are fully fusion welded, the lid is partially fusion welded to the shell. The stress reduction coefficient for the partial fusion welds of the confinement boundary was evaluated by applying a value of ‘0.8’ in accordance with NUREG-2215.

The internal components were applied with the requirements of ASME B&PV Code, Sec. III, Div.1, Subsec.NG,

Table 4. Allowable stress intensity of inner components

Stress intensity	Allowable stress		
	Normal condition	Off-normal condition	Accident condition
Primary membrane, Pm	1.0 Sm	1.1 Sm	Max (0.7 Su, Sy+(1/3)(Su-Sy))
Primary membrane plus primary bending, Pm+Pb	1.5 Sm	1.65 Sm	0.9 Su
Membrane plus primary bending plus secondary, Pm+Pb+Q	3.0 Sm	3.3 Sm	N/A


(a) Canister

(b) Frame, bottom plate

(c) Spacer, positioner, fuel support

(d) Basket

Fig. 2. Analysis model of the canister (ABAQUS).

where the allowable stress intensities used for evaluating the internal components are shown in Table 4 [9]. For the allowable stress intensities under normal and off-normal conditions, the Level A and B thresholds are applied from ASME B&PV Code, Sec. III, Div.1, Subsec. NG. Under accident conditions, the non-contained structure and internal components were analyzed using the plastic analysis method, as defined in ASME B&PV Code, Sec. III, Div.1, App F. The allowable stress intensities were also based on the same criteria.

5. Analysis Model

The structural analysis of the canister was performed by using the general purpose computational program ABAQUS 2017, while an identical structural analysis model was used to analyze each load combination by applying different initial and boundary conditions [10]. For the analytical model a 1/2 model (representing only 180° portion of the canister) is implemented in consideration of the symmetric nature of the canister. The canister was modeled with 366,498 solid

Table 5. Analysis results for normal condition [unit: MPa]

Component	Material	Stress	Allowable	Analysis		Safety factor	
				LC.1	LC.2	LC.1	LC.2
Canister lid	SA-240 TP.316 L	Pm	87.2	8.21	12.63	10.6	6.9
		Pm+Pb	130.8	10.18	20.62	12.8	6.3
		Pm+Pb+Q	261.6	75.35	85.79	3.5	3.0
Canister shell	SA-240 TP.316 L	Pm	105.4	35.87	54.44	2.9	1.9
		Pm+Pb	158.1	36.14	72.54	4.4	2.2
		Pm+Pb+Q	316.2	73.17	109.57	4.3	2.9
Canister baseplate	SA-240 TP.316 L	Pm	115.0	7.96	20.03	14.4	5.7
		Pm+Pb	172.5	11.57	32.00	14.9	5.4
		Pm+Pb+Q	345.0	19.94	40.37	17.3	8.5
Frame disc	SA-240 TP.304	Pm	115.2	0.28	0.64	411.4	180.0
		Pm+Pb	172.8	0.30	2.85	576.0	60.6
		Pm+Pb+Q	345.6	192.31	194.85	1.8	1.8
Frame shell	SA-240 TP.304	Pm	115.2	0.39	1.98	295.4	58.2
		Pm+Pb	172.8	0.73	5.48	236.7	31.5
		Pm+Pb+Q	345.6	124.70	129.45	2.8	2.7
Positioner	SA-479 TP.304	Pm	109.4	0.53	2.73	206.4	40.1
		Pm+Pb	164.1	0.74	38.87	221.8	4.2
		Pm+Pb+Q	328.2	134.38	172.50	2.4	1.9
Spacer	SA-240 TP.304	Pm	109.4	0.97	2.34	112.8	46.8
		Pm+Pb	164.1	0.97	2.61	169.2	62.9
		Pm+Pb+Q	328.2	211.83	213.46	1.5	1.5
Bottom plate	SA-240 TP.304	Pm	138.0	0.63	11.83	219.0	11.7
		Pm+Pb	207.0	0.71	26.12	291.5	7.9
		Pm+Pb+Q	414.0	85.57	110.98	4.8	3.7
Fuel basket	SA-240 TP.304	Pm	109.0	1.12	2.39	97.3	45.6
		Pm+Pb	163.5	1.13	2.40	144.7	68.2
		Pm+Pb+Q	327.0	213.76	215.05	1.5	1.5
Fuel support	SA-240 TP.304	Pm	131.7	2.81	10.72	46.9	12.3
		Pm+Pb	197.6	2.86	14.03	69.1	14.1
		Pm+Pb+Q	395.1	44.10	50.08	9.0	7.9

elements and 688,851 nodes. The solid elements used in the analysis were C3D8R (eight-node linear brick, reduced integration with hourglass control) elements. An elastic analysis was performed for the canister that comprised the confinement boundary, while the internal components were subjected to an elastic-plastic analysis. All structural analyses were based on a static analysis approach, while implementing the 'surface to surface' conditions provided by ABAQUS in consideration of the contact conditions of each component. Symmetric constraints were applied to the cross-section of the canister, considering its symmetry, while vertical constraints were applied to the bottom of the canister. The comprehensive geometry of the analysis model is shown in Fig. 2. A symmetrical boundary condition was applied to the half cross-section of the canister, while constraints were applied to the base and lid of the canister respective of the analysis conditions. As the welded canister lid and shell shared nodes, tie constraint conditions were applied between the elements. Structural components that do not affect the structure performance, such as port covers, were not included in the modeling.

ASME B&PV Code Sec. II, Part A and Part D were taken as references for the mechanical properties of the main materials used in the evaluation of the canister structure [11, 12]. While SA-240 Type 316 L was used for the canister, stainless steel (SA-240 Type 304, SA-479 Type 304) was used for the internal components, including the basket, frame, spacer, and positioner.

6. Load and Analysis Results

6.1 Normal Conditions

For normal conditions, the dead load, handling load, pressure load, and thermal load were assessed according to NUREG-2215, and combinations of these loads were subjected to a structural integrity evaluation. For the handling load, the load applied to the top of the canister lid when the canister is lifted from the transfer cask to be loaded inside the storage cylinder of the module structure was considered. In addition, to account for the effects of dynamic shocks according to ASME NOG-1, 115% of the weight of the canister was applied as the handling load [2]. The pressure load assumed the internal pressure of the canister under conditions where 1% of the total spent nuclear fuel is damaged, 100% of the confinement gas from the damaged spent nuclear fuel rod is released within the canister, with 30% of the damaged nuclear fuel releasing nuclear fissile gas, according to the assumptions presented in NUREG-2215. Pressure of 0.6264 MPa was applied for the internal pressure of the canister, which was calculated from the results of the thermal analysis. Korea's highest monthly average temperature of 33.3°C was applied for the thermal load, where the structural analysis was performed with the temperature distribution of the canister placed within the storage cylinder of the module structure set as the initial conditions.

The stress evaluation for the load combinations under the normal conditions tested the membrane, bending, and secondary stresses in line with the Level A evaluation criteria of ASME B&PV Code, Sec. III, Div. 1, Subsec. NB, NF, NG. Table 5 shows the stress evaluation results for load combinations LC.1 and LC.2 under normal conditions. Evaluation results for all components showed safety factors of 1.4 or higher, while the largest stress of 230.15 MPa was observed in the fuel basket. The safety factor of the canister that forms the confinement boundary was above 1.9, ensuring structural integrity under normal conditions.

6.2 Off-normal Conditions

Under off-normal conditions, the structural integrity of the canister was evaluated for pressure and thermal loads and the structural integrity was assessed for the load combinations in line with NUREG-2215. The pressure load assumes the internal pressure of the canister under conditions where 10% of the total spent nuclear fuel is damaged, 100% of the confinement gas from the damaged spent nuclear fuel rod is released within the canister, and 30% of the damaged nuclear fuel releasing nuclear fissile gas, under the condition of 50% blockage of the air inlet of the module structure. Pressure of 0.6587 MPa was applied for the internal pressure of the canister, which was calculated from the results of the thermal analysis.

The thermal load is based on the condition of 50% blockage of the air inlet of the module structure and the thermal analysis results of the canister under external temperature conditions ranging between the maximum (36.6°C) and minimum (−15.6°C) daily average temperatures in Korea.

Table 6. Analysis results for off-normal condition [unit: MPa]

Component	Material	Stress	Allowable	Analysis		Safety factor	
				LC.3	LC.4	LC.3	LC.4
Canister lid	SA-240 TP.316 L	Pm	87.2	8.21	13.06	10.6	6.7
		Pm+Pb	130.8	10.18	21.14	12.8	6.2
		Pm+Pb+Q	261.6	71.79	82.74	3.6	3.2
Canister shell	SA-240 TP.316 L	Pm	105.4	35.87	56.30	2.9	1.9
		Pm+Pb	158.1	36.14	74.41	4.4	2.1
		Pm+Pb+Q	316.2	71.94	110.21	4.4	2.9
Canister baseplate	SA-240 TP.316 L	Pm	115.0	7.96	21.59	14.4	5.3
		Pm+Pb	172.5	11.57	32.59	14.9	5.3
		Pm+Pb+Q	345.0	21.97	42.98	15.7	8.0
Frame disc	SA-240 TP.304	Pm	115.2	0.28	0.64	411.4	180.0
		Pm+Pb	172.8	0.3	2.85	576	60.6
		Pm+Pb+Q	345.6	190.77	193.31	1.8	1.8
Frame shell	SA-240 TP.304	Pm	115.2	0.39	1.98	295.4	58.2
		Pm+Pb	172.8	0.73	5.48	236.7	31.5
		Pm+Pb+Q	345.6	120.64	125.39	2.9	2.8
Positioner	SA-479 TP.304	Pm	109.4	0.53	2.73	206.4	40.1
		Pm+Pb	164.1	0.74	38.87	221.8	4.2
		Pm+Pb+Q	328.2	136.64	174.77	2.4	1.9
Spacer	SA-240 TP.304	Pm	109.4	0.97	2.34	112.8	46.8
		Pm+Pb	164.1	0.97	2.61	169.2	62.9
		Pm+Pb+Q	328.2	211.8	213.43	1.5	1.5
Bottom plate	SA-240 TP.304	Pm	138.0	0.63	11.83	219	11.7
		Pm+Pb	207.0	0.71	26.12	291.5	7.9
		Pm+Pb+Q	414.0	85.12	110.53	4.9	3.7
Fuel basket	SA-240 TP.304	Pm	109.0	1.12	2.39	97.3	45.6
		Pm+Pb	163.5	1.13	2.40	144.7	68.2
		Pm+Pb+Q	327.0	226.18	227.48	1.4	1.4
Fuel support	SA-240 TP.304	Pm	131.7	2.81	13.52	46.9	9.7
		Pm+Pb	197.6	2.86	16.89	69.1	11.7
		Pm+Pb+Q	395.1	43.2	49.18	9.1	8.0

The structural analysis of the thermal load was performed with the temperature distribution of the canister obtained from the thermal analysis set as the initial conditions.

The stress evaluation for the load combinations under the off-normal conditions tested the membrane, bending, and secondary stresses in line with the Level B evaluation criteria of ASME B&PV Code, Sec. III, Div. 1, Subsec. NB, NG. Table 6 shows the stress evaluation results for load combinations LC.3 and LC.4 under off-normal conditions. All components showed safety factors of 1.4 or above, demonstrating structural integrity under off-normal conditions.

Table 7. Analysis results for accident condition (1/2) [unit: MPa]

Component	Material	Stress	Allowable	Analysis		Safety factor	
				LC.5	LC.6	LC.5	LC.6
Canister lid	SA-240 TP.316 L	Pm	193.9	13.06	9.11	14.8	21.3
		Pm+Pb	290.9	21.14	11.22	13.8	25.9
Canister shell	SA-240 TP.316 L	Pm	224.59	56.30	56.35	4.0	4.0
		Pm+Pb	336.89	74.41	56.64	4.5	5.9
Canister baseplate	SA-240 TP.316 L	Pm	247.2	21.59	12.77	11.4	19.4
		Pm+Pb	370.8	32.59	16.35	11.4	22.7
Frame disc	SA-240 TP.304	Pm	423.56	0.64	34.59	661.8	12.2
		Pm+Pb	544.57	2.85	40.46	191.1	13.5
Frame shell	SA-240 TP.304	Pm	423.56	1.98	38.05	213.9	11.1
		Pm+Pb	544.57	5.48	63.86	99.4	8.5
Positioner	SA-479 TP.304	Pm	411.8	2.73	13.12	150.8	31.4
		Pm+Pb	529.45	38.87	14.45	13.6	36.6
Spacer	SA-240 TP.304	Pm	411.8	2.34	40.94	176.0	10.1
		Pm+Pb	529.45	2.61	44.25	202.9	12.0
Bottom plate	SA-240 TP.304	Pm	428.26	11.83	18.94	36.2	22.6
		Pm+Pb	550.62	26.12	34.92	21.1	15.8
Fuel basket	SA-240 TP.304	Pm	410.03	2.39	28.23	171.5	14.5
		Pm+Pb	527.18	2.40	28.85	220.0	18.3
Fuel support	SA-240 TP.304	Pm	428.26	13.52	15.11	31.7	28.3
		Pm+Pb	550.62	16.89	28.47	32.6	19.3

6.3 Hypothetical Accident Conditions

Under accident conditions, the structural integrity of the canister is evaluated in line with NUREG-2215 for its pressure and earthquake loads, and the structural integrity was assessed for different load combinations. The pressure load assumes the internal pressure of the canister where 100% of the total spent nuclear fuel is damaged, 100% of the confinement gas from the damaged spent nuclear fuel rod is released within the canister, and 30% of the damaged nuclear fuel releasing nuclear fissile gas, under the buried conditions of the module structure. Pressure of 1.0874 MPa was applied for the internal pressure of the canister, which was calculated from the results of the thermal analysis. The canister is subjected to structural analysis and stress evaluations under thermal loads, where the temperature distribution of the canister within a storage cylinder under buried conditions was set as initial conditions. The duration time of the fire condition was calculated by considering the burning time of the fuel in the transport vehicle operating at the power plant. As allowable stress intensities are not available for the secondary stress caused by the thermal loads of the accident, they were excluded from the evaluation.

The canister is located inside the storage cylinder, which is embedded in the upper slab of the module structure. With a natural frequency of more than 33 Hz, the storage cylinder behaves as a rigid body, and consequently seismic accelerations on the top and bottom of the module structure

Table 8. Analysis results for accident condition (2/2) [unit: MPa]

Component	Material	Stress	Allowable	Analysis		Safety factor	
				LC.7	LC.8	LC.7	LC.8
Canister lid	SA-240 TP.316 L	Pm	193.9	8.64	18.53	22.4	10.5
		Pm+Pb	290.9	10.71	27.93	27.2	10.4
Canister shell	SA-240 TP.316 L	Pm	224.59	37.72	80.36	6.0	2.8
		Pm+Pb	336.89	38.01	98.65	8.9	3.4
Canister baseplate	SA-240 TP.316 L	Pm	247.2	9.51	27.57	26.0	9.0
		Pm+Pb	370.8	12.16	40.24	30.5	9.2
Frame disc	SA-240 TP.304	Pm	423.56	0.28	0.64	1,512.7	661.8
		Pm+Pb	544.57	0.30	2.85	1,815.2	191.1
Frame shell	SA-240 TP.304	Pm	423.56	0.39	1.98	1,086.1	213.9
		Pm+Pb	544.57	0.73	5.48	746.0	99.4
Positioner	SA-479 TP.304	Pm	411.8	0.53	2.73	777.0	150.8
		Pm+Pb	529.45	0.74	38.87	715.5	13.6
Spacer	SA-240 TP.304	Pm	411.8	0.97	2.34	424.5	176.0
		Pm+Pb	529.45	0.97	2.61	545.8	202.9
Bottom plate	SA-240 TP.304	Pm	428.26	0.63	11.83	679.8	36.2
		Pm+Pb	550.62	0.71	26.12	775.5	21.1
Fuel basket	SA-240 TP.304	Pm	410.03	1.12	2.39	366.1	171.5
		Pm+Pb	527.18	1.13	2.40	466.5	220.0
Fuel support	SA-240 TP.304	Pm	428.26	2.81	13.52	152.4	31.7
		Pm+Pb	550.62	2.86	16.89	192.5	32.6

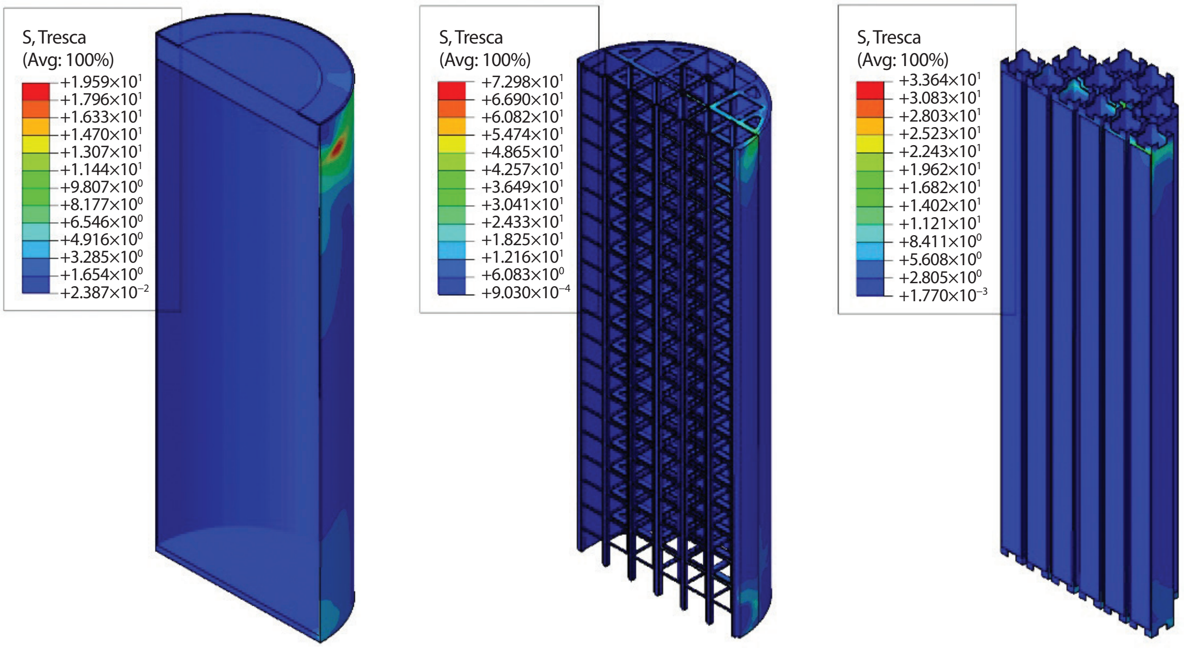
identical. Therefore, the seismic acceleration applied for the seismic analysis of the canister is taken from the top of the module structure. The seismic loads applied on the canister from the X, Y, and Z directions were 0.3 g, 0.583 g, and 0.611 g, respectively. For the structural analysis of the canister, a static analysis was performed by conservatively applying self-weight of 1 g in the horizontal direction and 2 g in the vertical direction.

A stress evaluation for the load combinations under accident conditions was performed according to the Level D evaluation criteria of ASME B&PV Code, Sec. III, Div. 1, Subsec. NB, NG for the membrane and bending stresses, excluding secondary stress, and the results are shown in Tables 7 and 8.

While the largest stress was observed from the load combination that included the seismic conditions, all load combinations have shown results below the allowable stress intensities for all assessed conditions. The structural integrity is thus secured under accident conditions.

7. Conclusions

This study evaluated the structural integrity of a spent nuclear fuel canister based on design standards and design loads. The structural integrity was evaluated under normal,



(a) Canister (b) Inner components (c) Baskets

Fig. 3. Stress distribution for earthquake condition.

off-normal, and accident conditions, where a structural analysis was performed for each load condition, and the consequent combinations of the different load conditions were assessed for stress through comparison with the allowable stress intensities defined in the ASME B&PV Code.

1) While internal components installed for spacing and protection of spent nuclear fuel under normal and off-normal conditions showed low stress levels overall, LC.6, which includes seismic conditions, showed relatively higher levels of stress on the internal components due to the seismic load.
2) An evaluation of all load combinations under normal, off-normal, and accident conditions presented stress levels below the allowable stress intensities.

In conclusion, the subject of this study, a 24-bundle canister, has been evaluated to satisfy the design requirements for all conditions. The evaluation results of this study will serve as a baseline reference for canister design in the future.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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