3-D Rendering of Images obtained during the Fukushima Daiichi Nuclear Power Station Unit 3 Primary Containment Vessel (PCV) Internal Investigation

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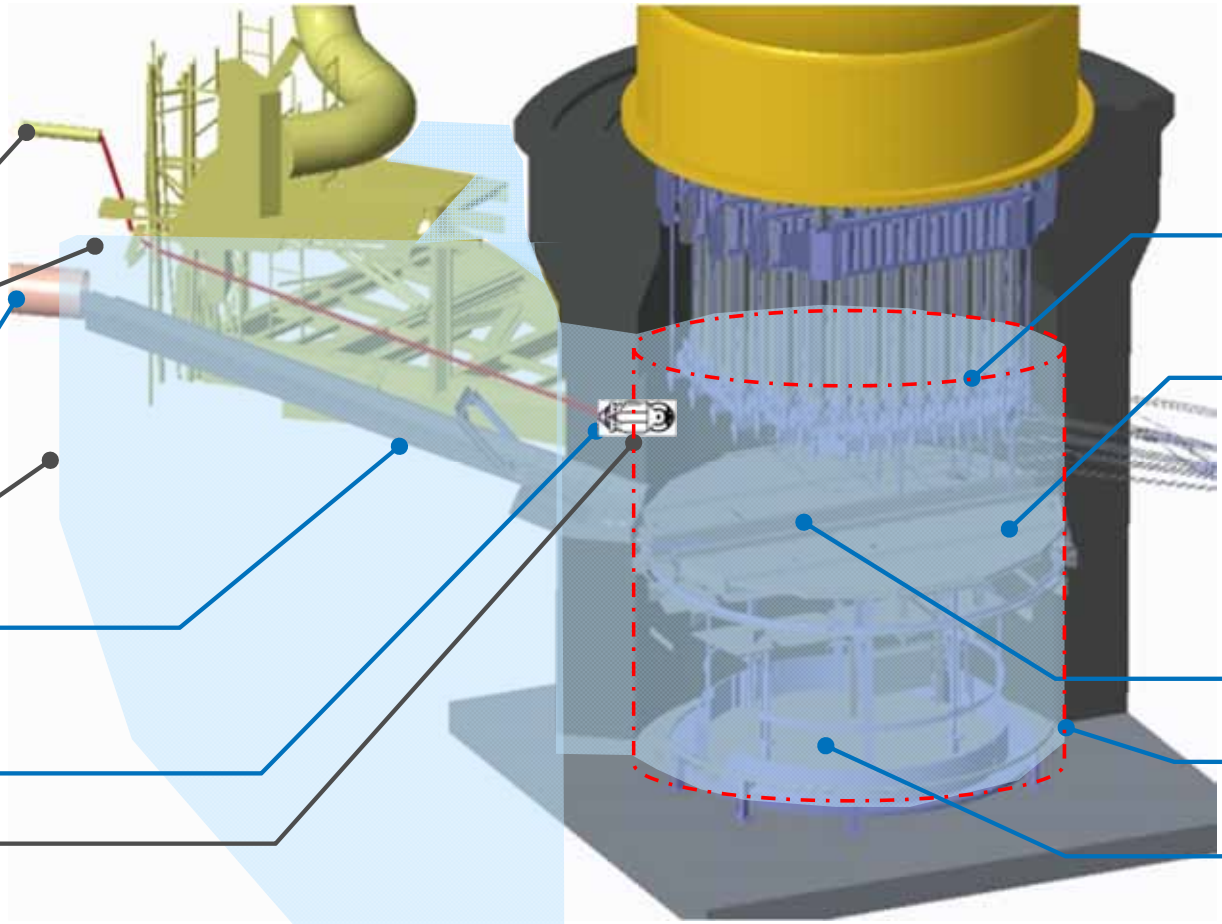
TEPCO

Tokyo Electric Power Company Holdings, Inc.

1. 3-D rendering from images taken

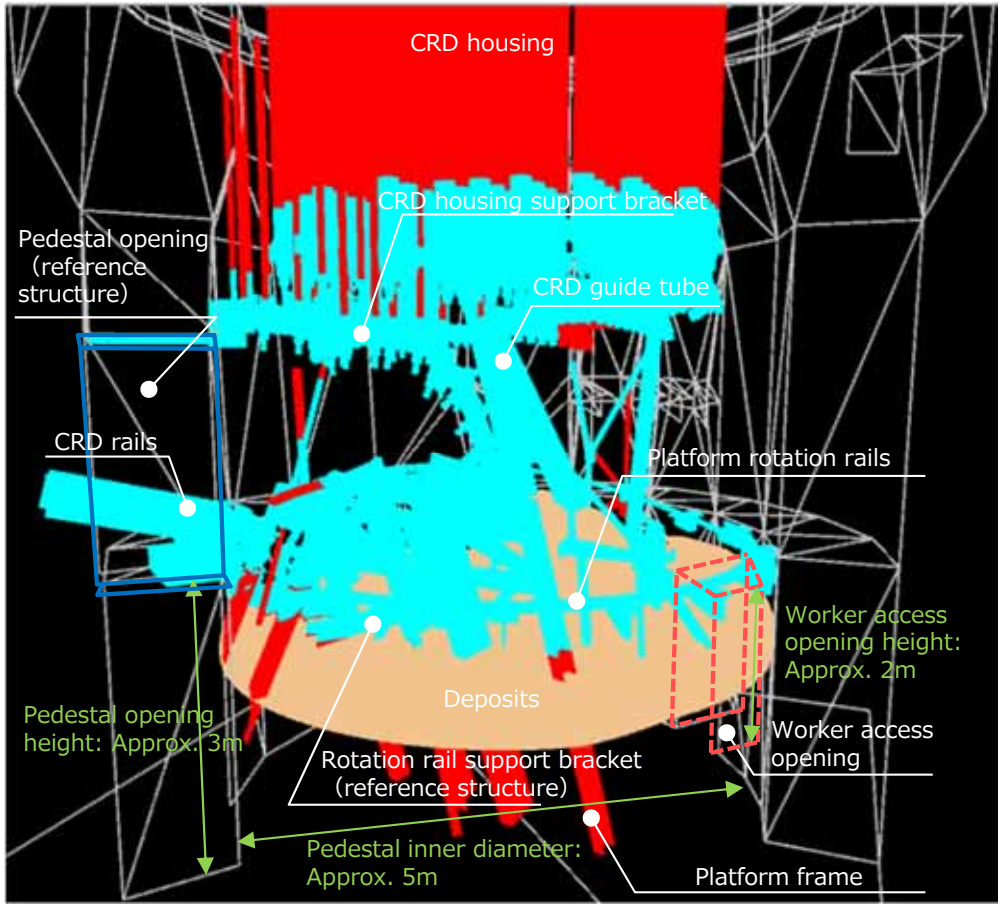
- Images obtained during the PCV internal investigation conducted in July 2017 were used to create a three-dimensional rendering of the entire pedestal using Structure from Motion (SfM).
- For areas where images were not taken during the internal investigation design data for structures was used to make estimates based upon which a three-dimensional image was rendered.
- Objects for which position could not be estimated and objects that could not be ascertained because they did not appear for long enough, were unclear, or were only partially visible in the videos, were not rendered.

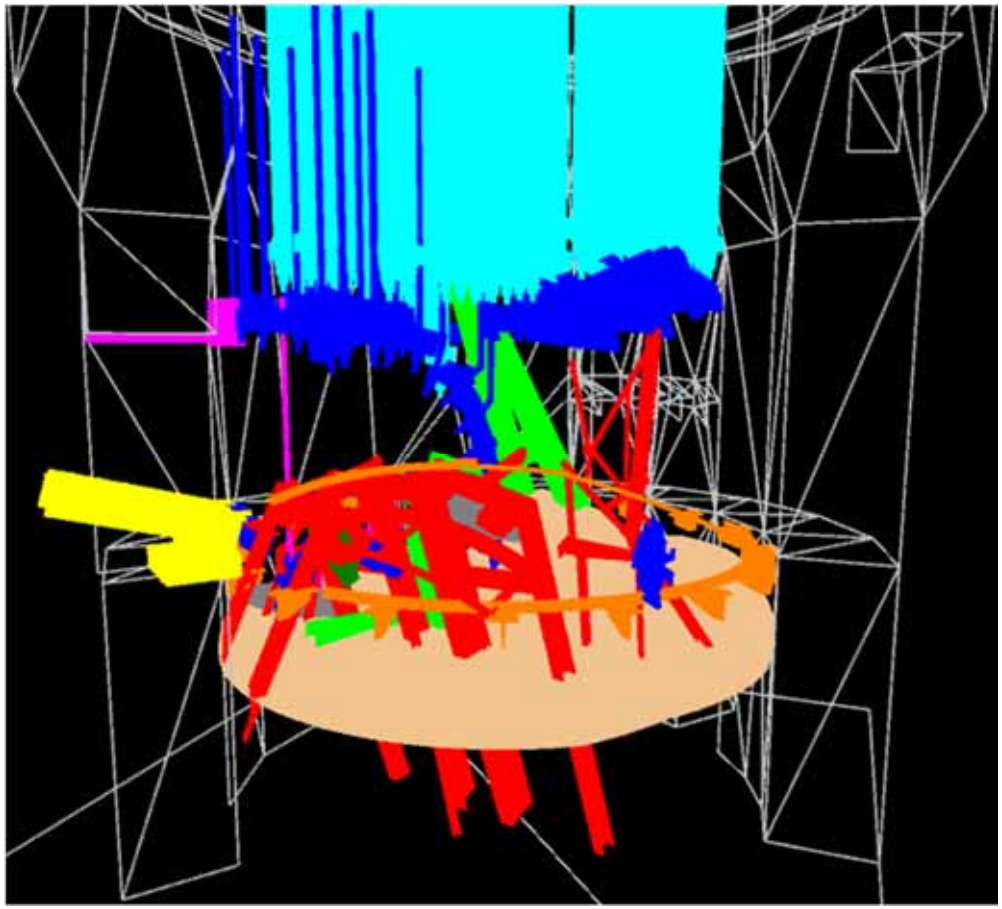


Range of three-dimensional rendering of structures

2. Scope of structures identified in the videos

- The rendering contains structures that were identified in the videos as well as structures that were rendered based upon estimates made using design information because they could not be identified in the videos.
- Since no significant damage could be seen to the pedestal opening or a portion of the rotation rail support brackets, these structures were used as reference points for the 3-D rendering based upon the assumption that they are in the same position as they were prior to the accident.
- The rendering was created in order to get an overall feel for conditions inside the pedestal and therefore the positions of structures are only approximations.





: Structures identified in the videos

: Structures that could not be identified in the videos (the estimated from design data)

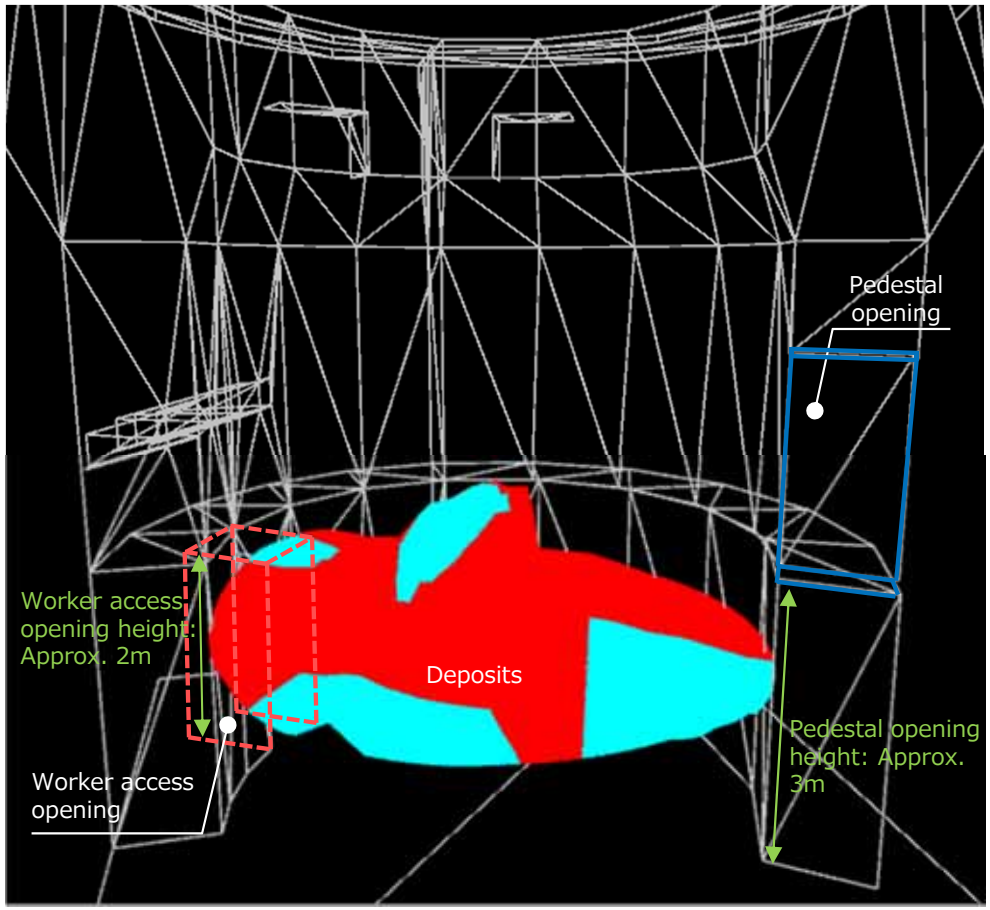
: Platform, frame, etc., structures
: Platform rotation motor
: CRD housing support bracket
: CRD housing

: CRD guide tube
: CRD replacement rails
: Platform rotation rails, support brackets
: Terminal boxes, electric wire conduits, pipes
: Grating

Image creation: Toshiba Energy Systems & Solutions Corporation

3. Scope of deposits identified in the videos

- The height of deposits identified in the videos was estimated based upon the location of structures in the vicinity (pedestal opening and a portion of the rotation rail support brackets) to recreate the approximate height of the deposits.
- Since a large portion of the deposits could not be seen on the video they were re-created based upon the estimated height of deposits that could be seen in the video.
- Structures are not shown in the diagram on this page to make it easier to see the deposits



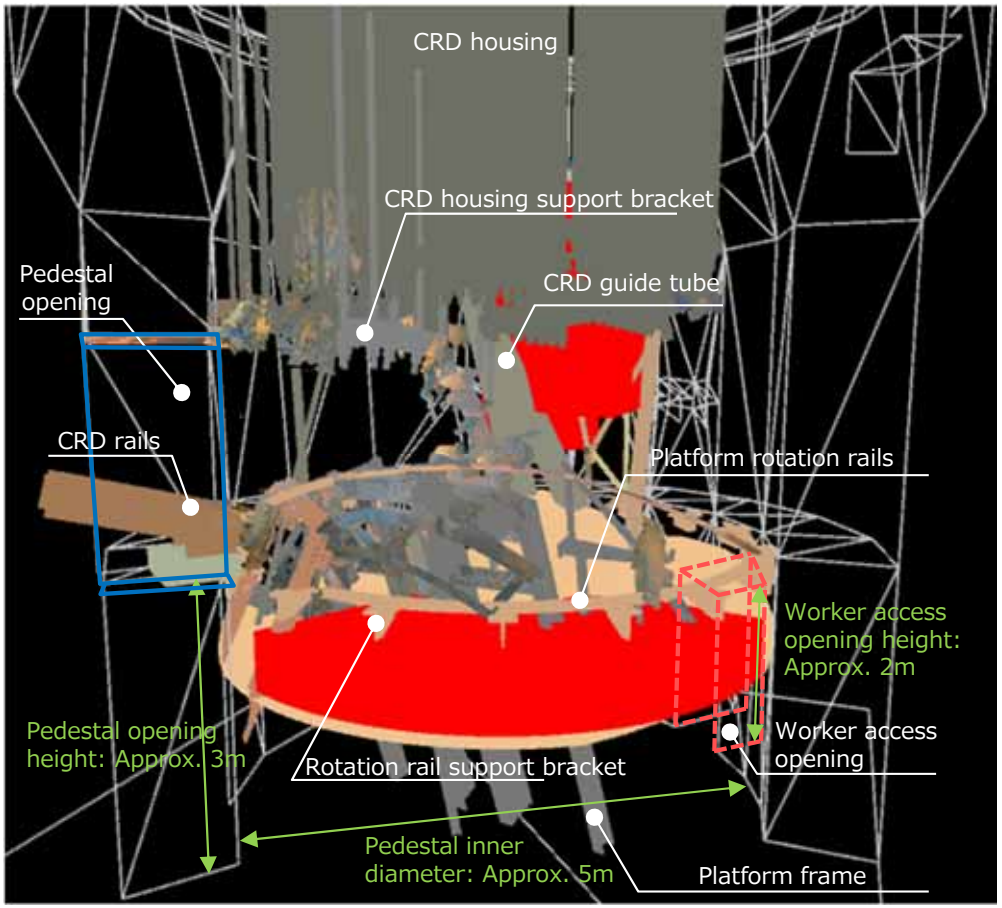
: Structures identified in the videos

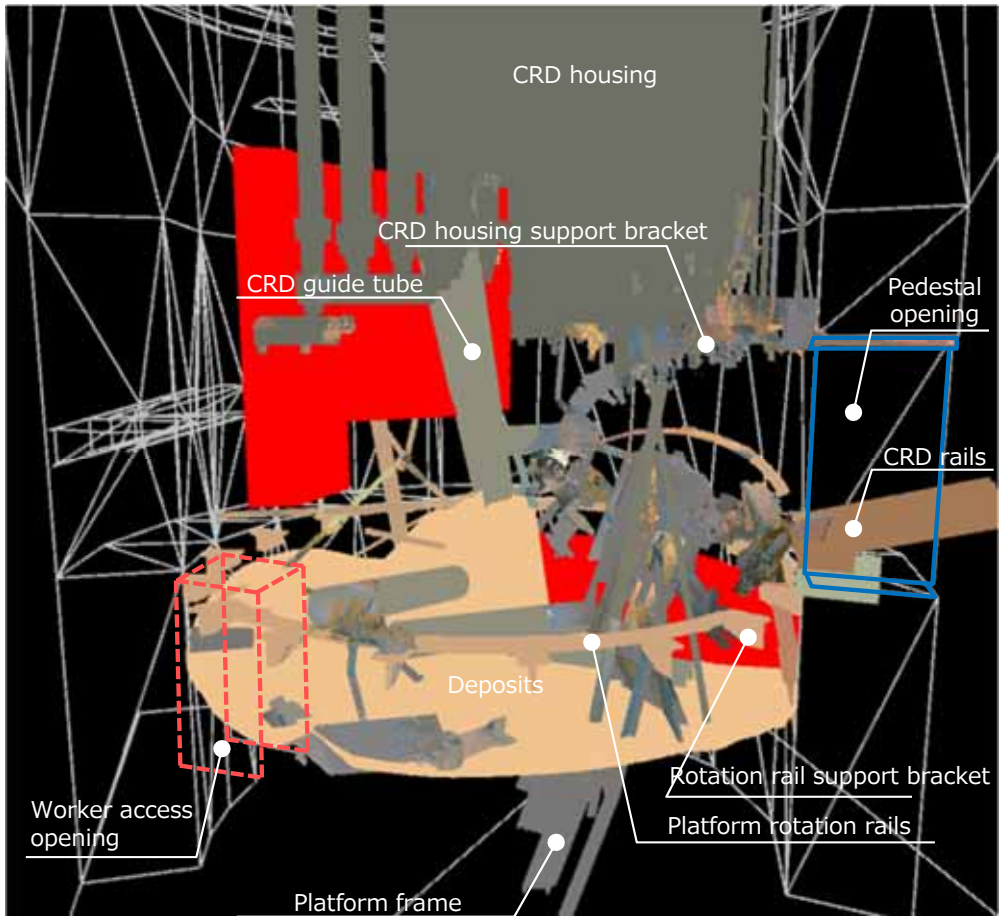
: Range that could not be identified in the videos (created using areas that could be identified in the video)

Image creation: Toshiba Energy Systems & Solutions Corporation

4. Estimating spaces not visible on the videos

- Spaces that could not be captured on video due to the churning up of deposits during the July 2017 investigation were estimated.
- Structures may exist in the spaces that could not be captured on video



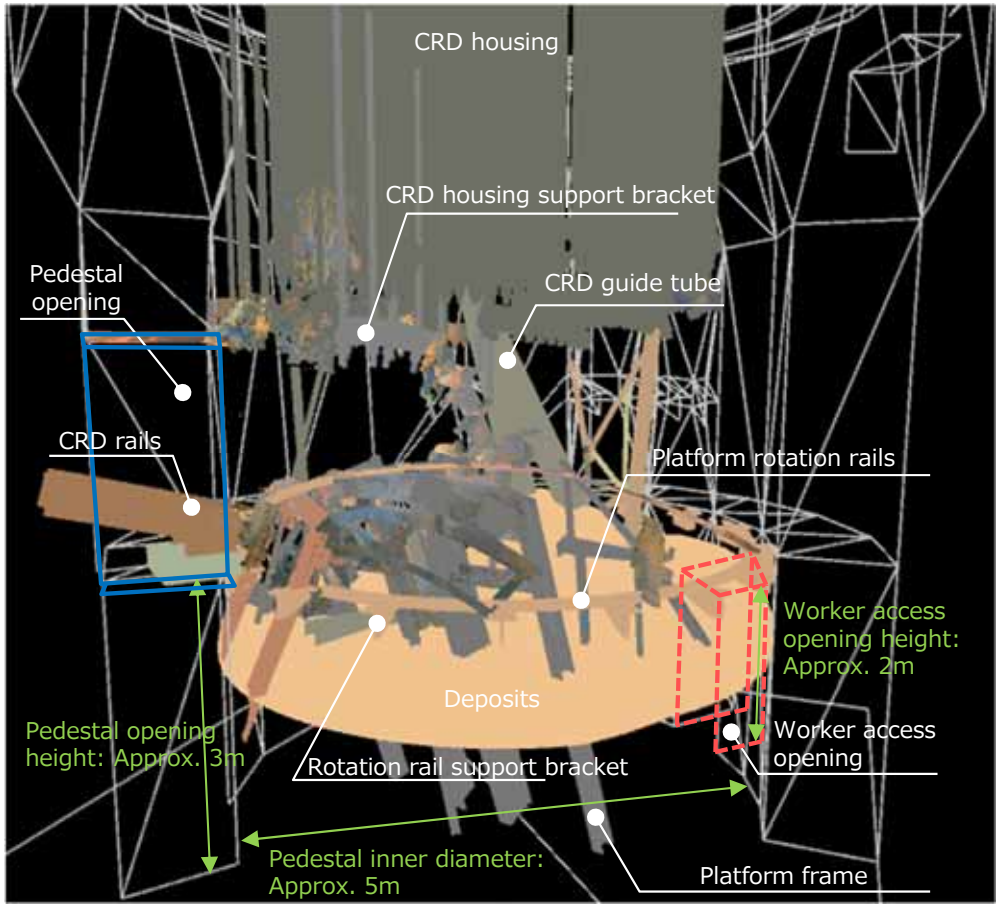


: Spaces that were not captured on video

Image creation: Toshiba Energy Systems & Solutions Corporation

5. Assumptions from 3-D rendering

- The platform has been dislodged from the rails and a portion of it is buried in deposits
- The height of deposits is highest in the center and gets lower as you move away from the center.
- It is possible that the reason why deposits are higher in the center is because structures, such as the CRD replacer, exist directly underneath



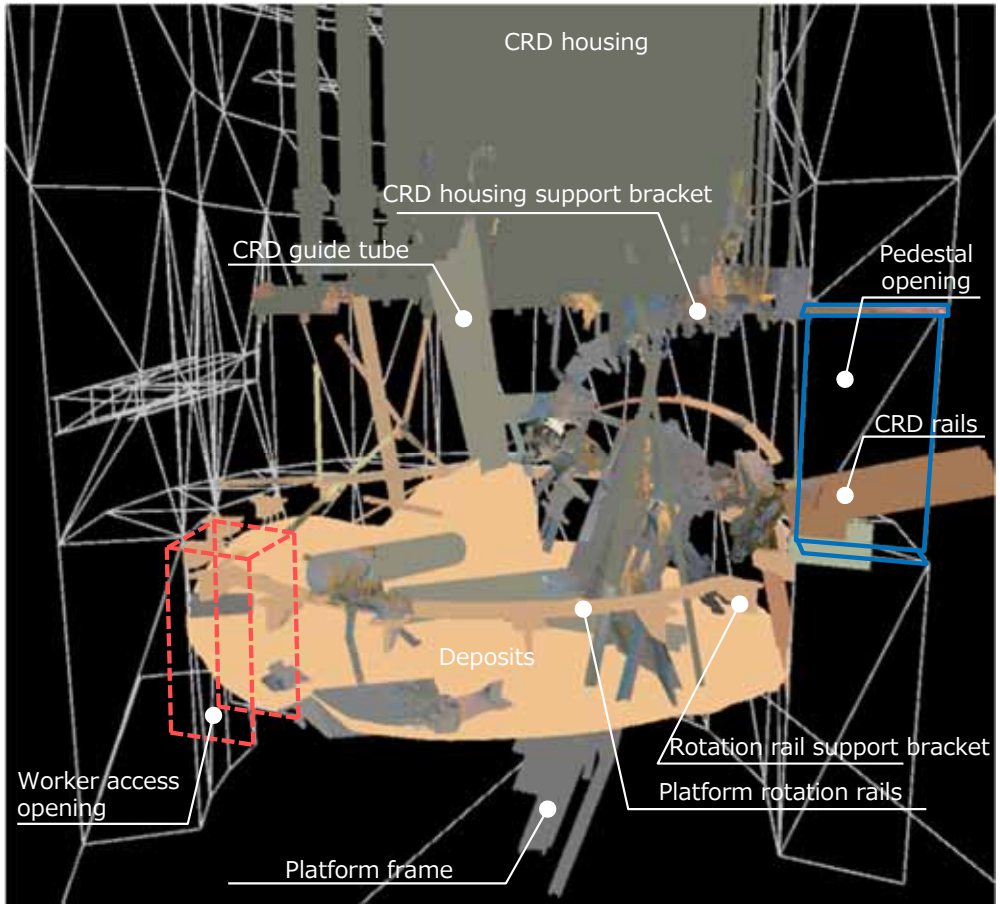


Image creation: Toshiba Energy Systems & Solutions Corporation

6. Conclusion

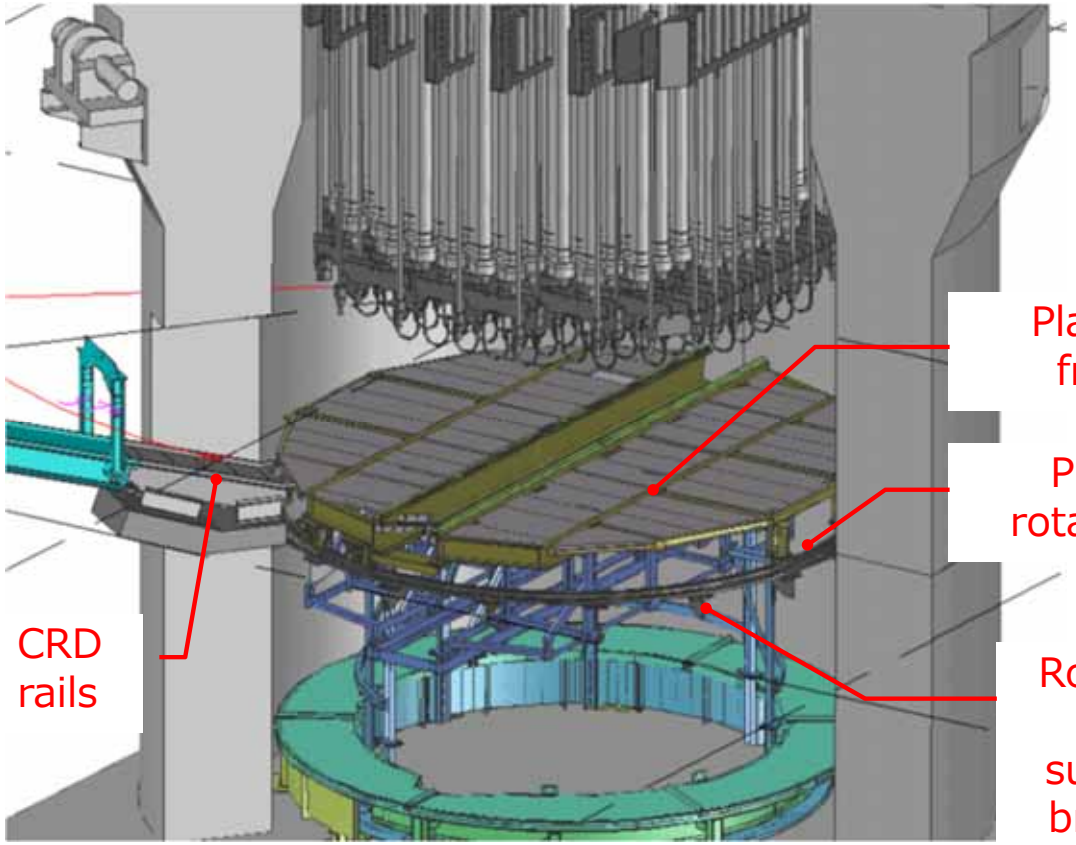
＜ Conditions inside the pedestal based upon the 3-D rendering ＞

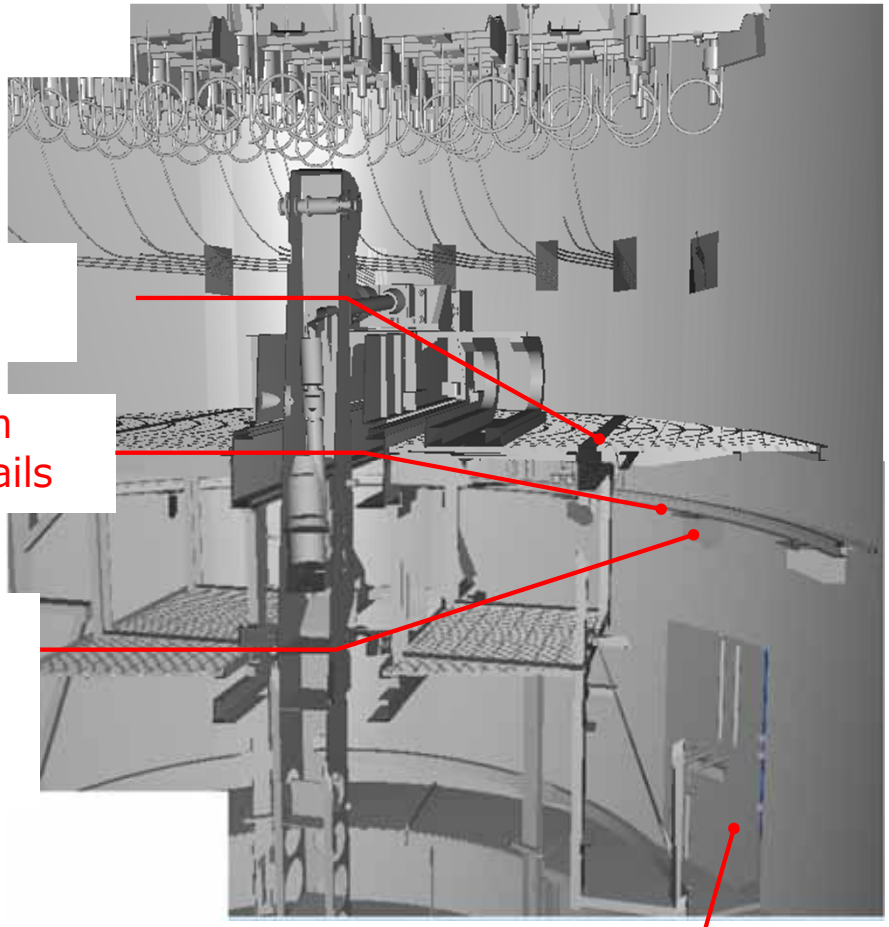
- Creating a 3-D rendering of the inside of the pedestal enabled us to visibly ascertain the relative location of structures as you move inside the pedestal from the CRD rails, and we were able to learn that the CRD housing support brackets have fallen off and that the platform is dislodged from the rails.
- Deposits are highest at the center but considering the fact that the platform is dislodged and that the CRD replacer could not be seen in the video, it is possible that the reason why deposits are higher is because molten material that may contain fuel debris fell on top of the CRD replacer.

＜Measures going forward＞

- This rendering enabled us to get an overall view of the structures that have fallen into the pedestal. Based on these results and data that has been obtained to date, we will plan more investigations as we continue to deliberate the removal of fuel debris, such as the designing of fuel debris removal equipment and removal procedures.

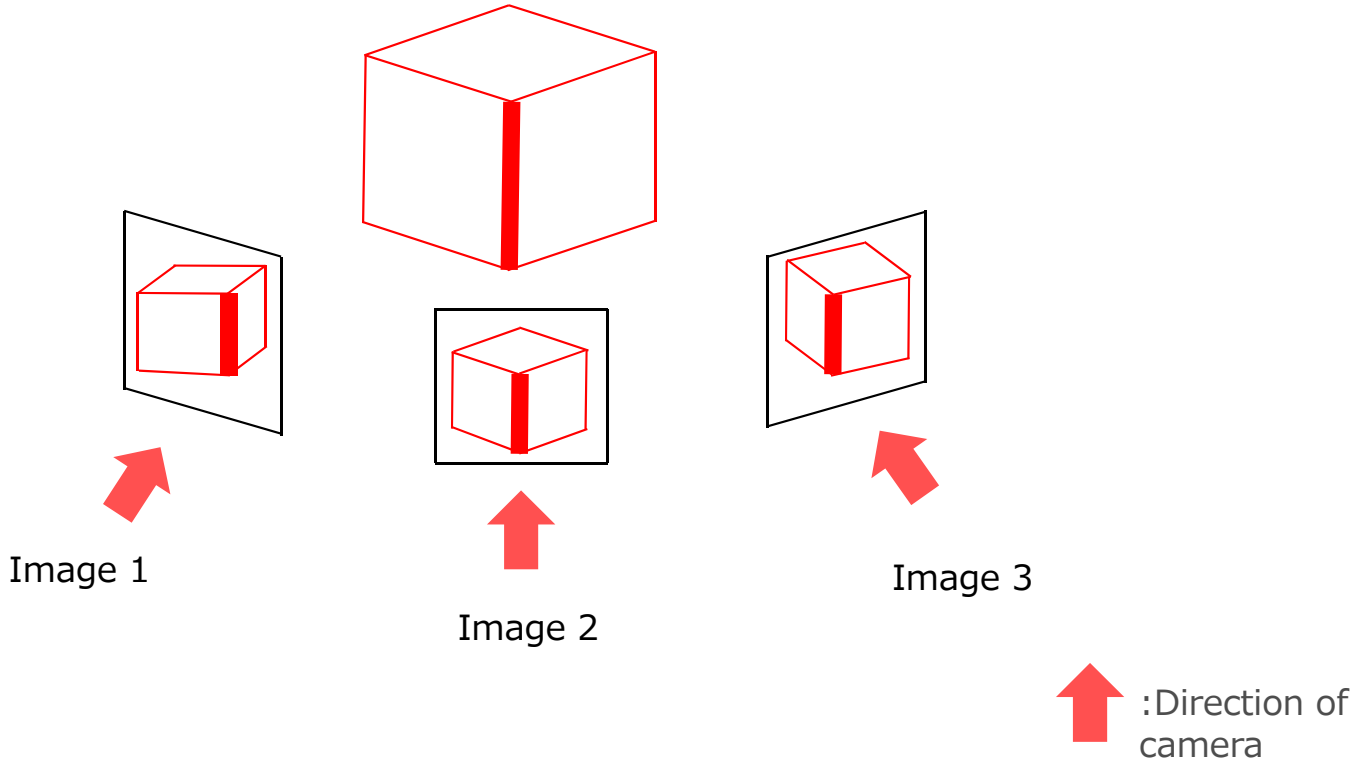
(Reference 1) Structures inside the pedestal





(Reference 2) Structure from Motion（SfM）

- Structure from Motion (SfM) is technology for rendering a 3-D image from images taken in succession from a single camera as it moves about.
- Corresponding points in the images are identified and the perspective points compared to render a 3-D image.



SfM concept diagram