

## MAP & ACCESS



**NARREC**

### When coming by car

About 8 minutes (about 4 km) from the "Hirono Interchange on the Joban Expressway through Prefectural Road No. 393 and National Highway No. 6

### When coming by train and getting off at **Kido Station**

Get off at Kido Station, which is 30 minutes from Iwaki Station on the JR Joban Line, and then take a taxi drive of about 5 minutes (about 2 km).

\* Please reserve a taxi in advance since the train station is unmanned. (It is about a 30-minute walk from the station.)

- Naraha Taxi Tel: +81-240-25-2131
- Winds Travel Tel: +81-240-23-6181

### Information on the facility tour

- Content of the tour**
- Overview of NARREC
  - Virtual reality (VR) experience
  - Visit to the Full-scale Mock-up Test Building (Motion Capture, Mock-up Stairs and Test Pool)

- Time needed**
- Approx. 60 minutes (subject to change depending on what you would like to see)

- How to apply**
- After calling us in advance, please fill out the facility tour application form and send it by email or fax. The application form can be downloaded from our website.

- Inquiries and application** **General Affairs Section**



### Inquiries and application

Phone: +81-240-26-1040 Fax: +81-240-26-1041

E-mail: naraha\_mockup@jaea.go.jp

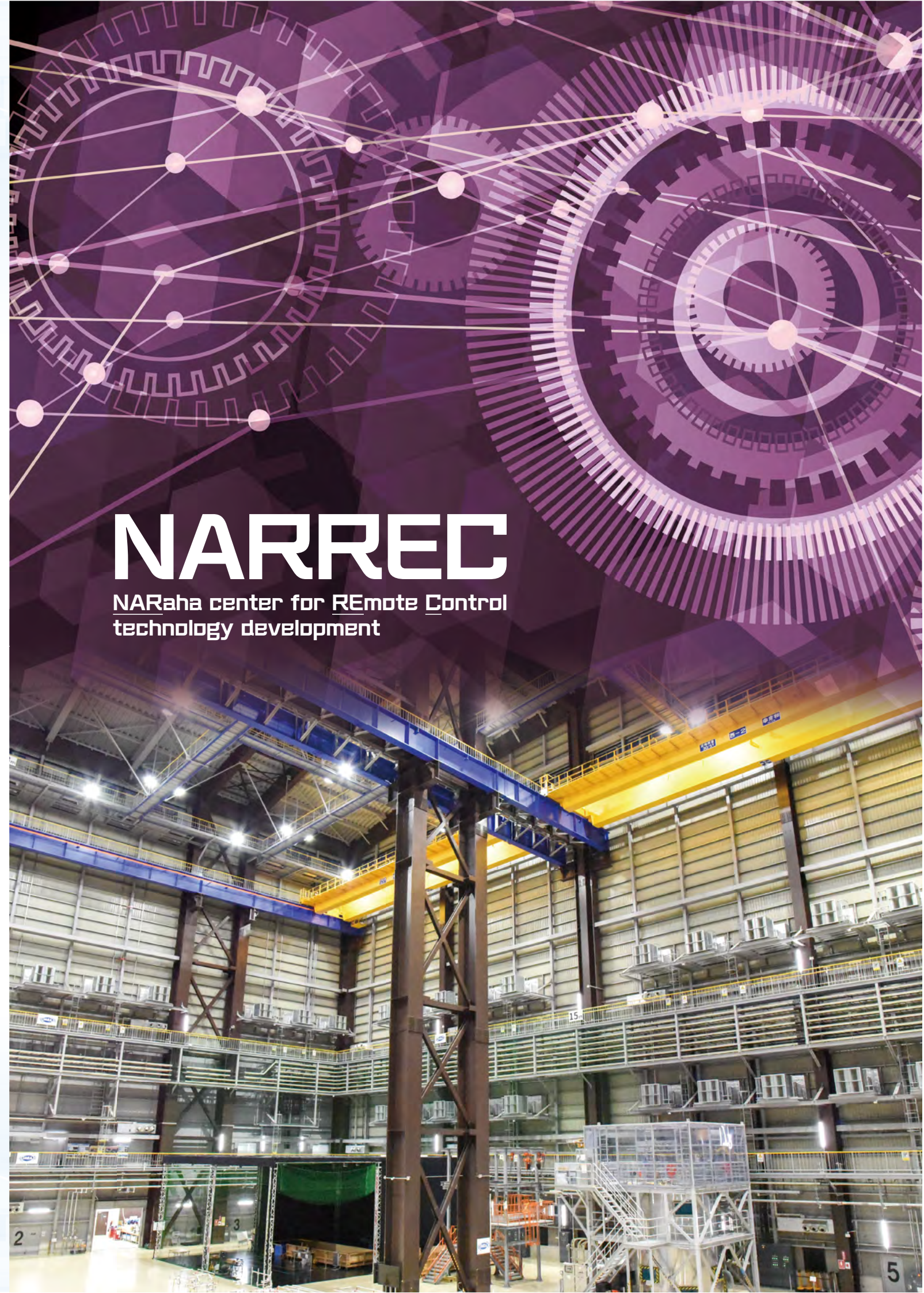
HP



Japan Atomic Energy Agency

## Naraha Center for Remote Control Technology Development

Nakamaru 1-22, Yamadaoka, Naraha-machi, Futaba-gun, Fukushima, 979-0513, JAPAN



# NARREC

NARaha center for REMote Control technology development

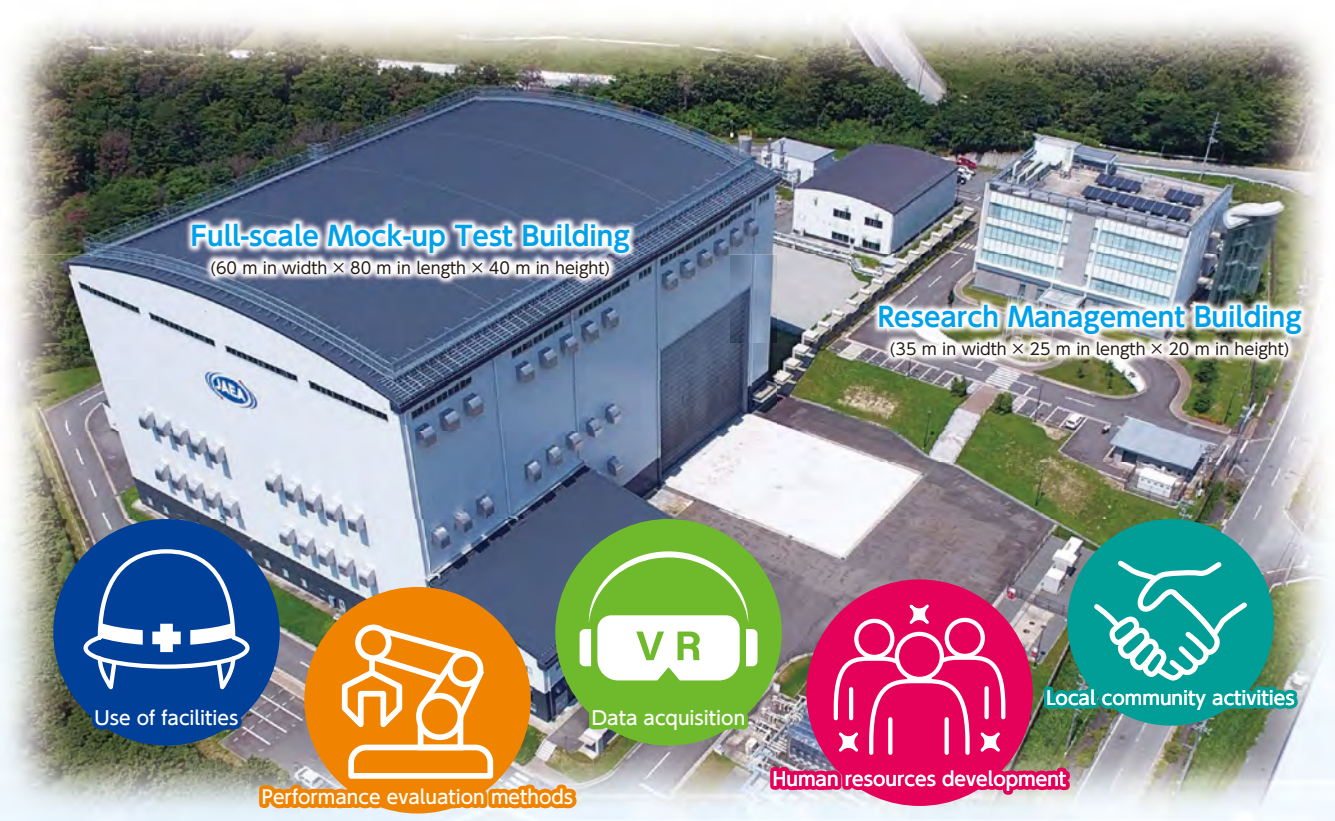
# Decommissioning one step ahead with digital technology

The Naraha Center for Remote Control Technology Development (NARREC) of the Japan Atomic Energy Agency (JAEA) is Shared use facilities\* established to promote the decommissioning of the Fukushima Daiichi Nuclear Power Plant (1F) of Tokyo Electric Power Company Holdings, Inc. The facilities have been in service since April 2016.

In NARREC's Full-scale Mock-up Test Building, which offers a wide space, users can conduct various types of tests using a mock-up facility that reproduces equipment in the reactor building at actual scale. In addition, research and development is also underway to contribute to decommissioning of 1F using digital technology.

A variety of testing devices useful in enhancing remote control technology are available, and technologies can be developed effectively by combining test field/method and robot performance evaluation methods.

\*Shared use facilities: Those facilities owned by JAEA that are available for use by corporations, universities, research institutions and other organizations outside the agency



## Examples of facility use

NARREC facilities are open for public use as well as decommissioning on 1F.

### Example of use related to 1F decommissioning



Development of technology for detailed investigation of the interior of the primary containment vessel by IRID

Full-scale mock-up test using one fourth of the Full-scale Mock-up Test Building area.



Workability verification and skill training related to Unit 2 R/B operating floor decontamination

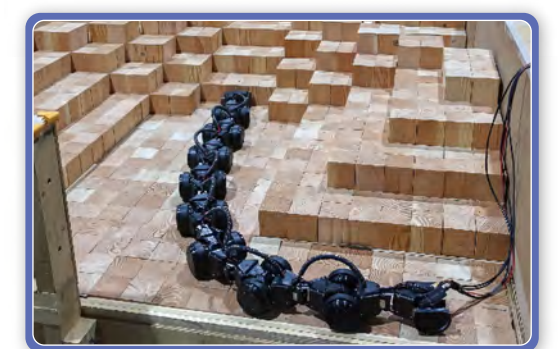
Training taking full advantage of the height of the Full-scale Mock-up Test Building and using water in an environment similar to the actual site

### Examples of use for testing robots and other devices



VT inspection using an underwater drone

Simulation test in which a 30-ton overhead traveling crane collaborates with a water tank with an underwater drone submerged in the tank



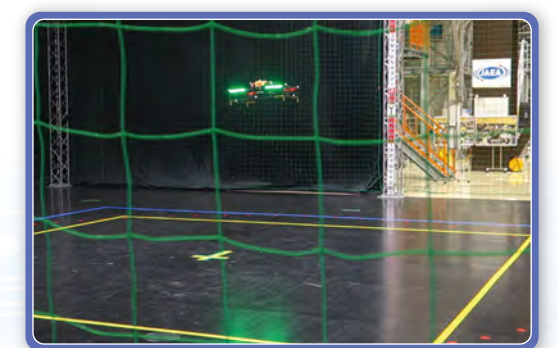
Establishment of semi-autonomous remote control technology for articulated mobile robots

Verification testing for robot control using diverse test fields



Travelling performance test for a quadruped walking robot

Ascending/descending performance test using Mock-up Stairs whose tilt angle, handrail width and board material can be changed



Performance test for inertial measurement units

Comparison of a drone's self-positioning performance with motion capture measurement results for quantitative analysis

# Efficient technology development by “Virtual × Real”



## Use of facilities

A variety of testing devices useful in enhancing remote control technology are available. The facilities also include laboratories and meeting rooms to accept a various user needs.



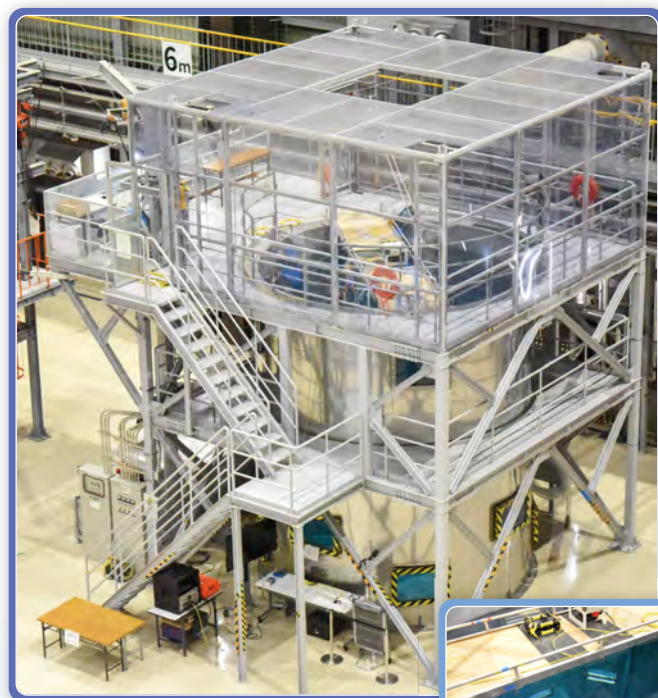
### Motion Capture

The movement of drones, robots, etc. can be measured quantitatively in a wide spatial domain.



### Mock-up Stairs

The tilt angle, handrail width, stair rotation direction and step board material can be changed, allowing many different tests to be conducted.



### Test Pool

Cylinder-type water tank for use in verification testing. Various types of water quality can be simulated, and tests covering depths of up to 5 meters can be conducted.



Machine shop

Multipurpose room



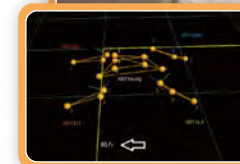
In addition, NARREC has the following facilities for rent.

- Laboratories (1 to 6)
- Meeting rooms (1 to 3)
- Lecture rooms (1 and 2)
- Warehouses (1 and 2)
- Multipurpose testing area (outdoor)



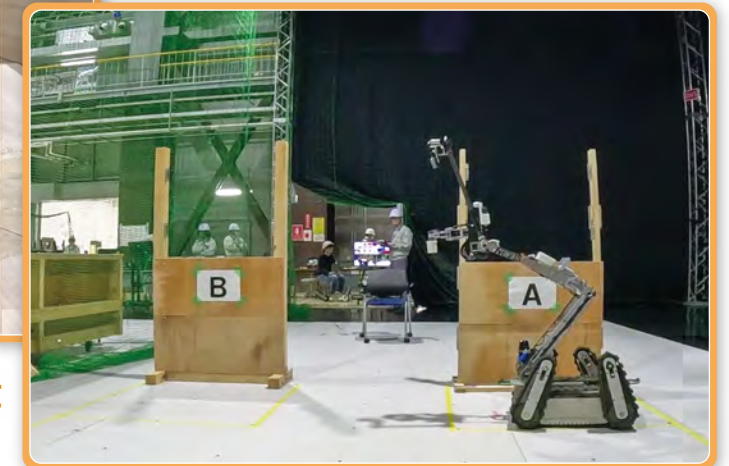
## Performance evaluation methods

Services are provided for testing capabilities that are useful for decommissioning work as well as for disaster response and infrastructure inspection, with the aim of promoting robot technology development.

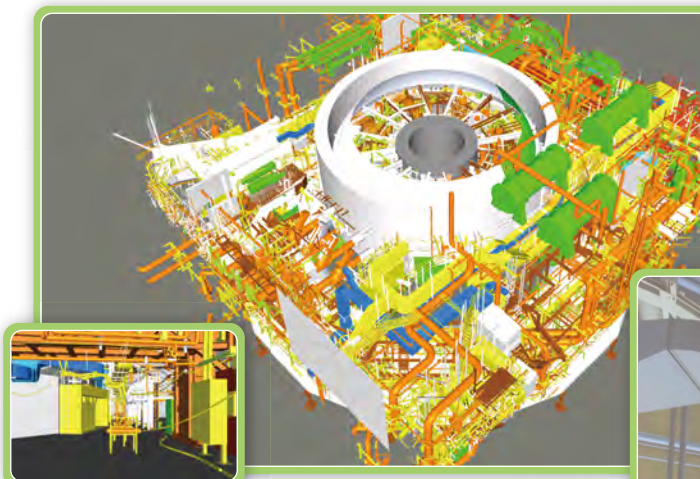


### Performance data measurement

Tests can be conducted that assume movement on rough terrain and robot arm operation anticipated to be involved in decommissioning work.



## Data acquisition



### Projection of digital data

Digital data, such as point cloud data and CAD data, can be projected onto a large 3D screen. A full-scale projection space is available for work discussions, reviews, etc.

### Provision of 1F data

The CAD data of 1F, which can be used in decommissioning-related discussions, equipment design, advance review of the site situation, etc., is acquired, integrated and provided.

\* There are conditions for the provision of data. For details, please contact us.





## Human resources development

In advancing the decommissioning work of 1F, which is said to continue for decades to come, it is essential to develop a younger generation of human resources. NARREC promotes human resources development through various activities.

### Robot Operation Training Program

We have a Robot Operation Training Program for a broad range of participants, from junior high school students to corporate employees.



### Robot competitions

Our facilities are also used as the venues of robot competitions aimed to nurture future robot developers.

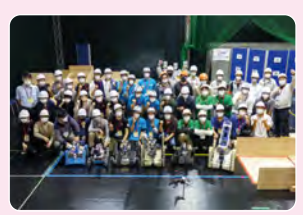
#### Creative Robot Contest for Decommissioning

Technical college students from all over the country compete by using the robots they have built on their own to solve problems assumed for the actual decommissioning process.



#### RoboCup Japan Open

In this competition, the capabilities of disaster response robots that gather information and perform tasks on behalf of human workers at a disaster site are evaluated from a comprehensive perspective.



## Local community activities

We actively communicate with members of the local community to promote understanding of NARREC's activities.



### Narahakko Children's Classroom

To introduce robots to local elementary school students, we provide robot exposure opportunities through Narahakko Children's Classroom, Naraha Towns' after-school program supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

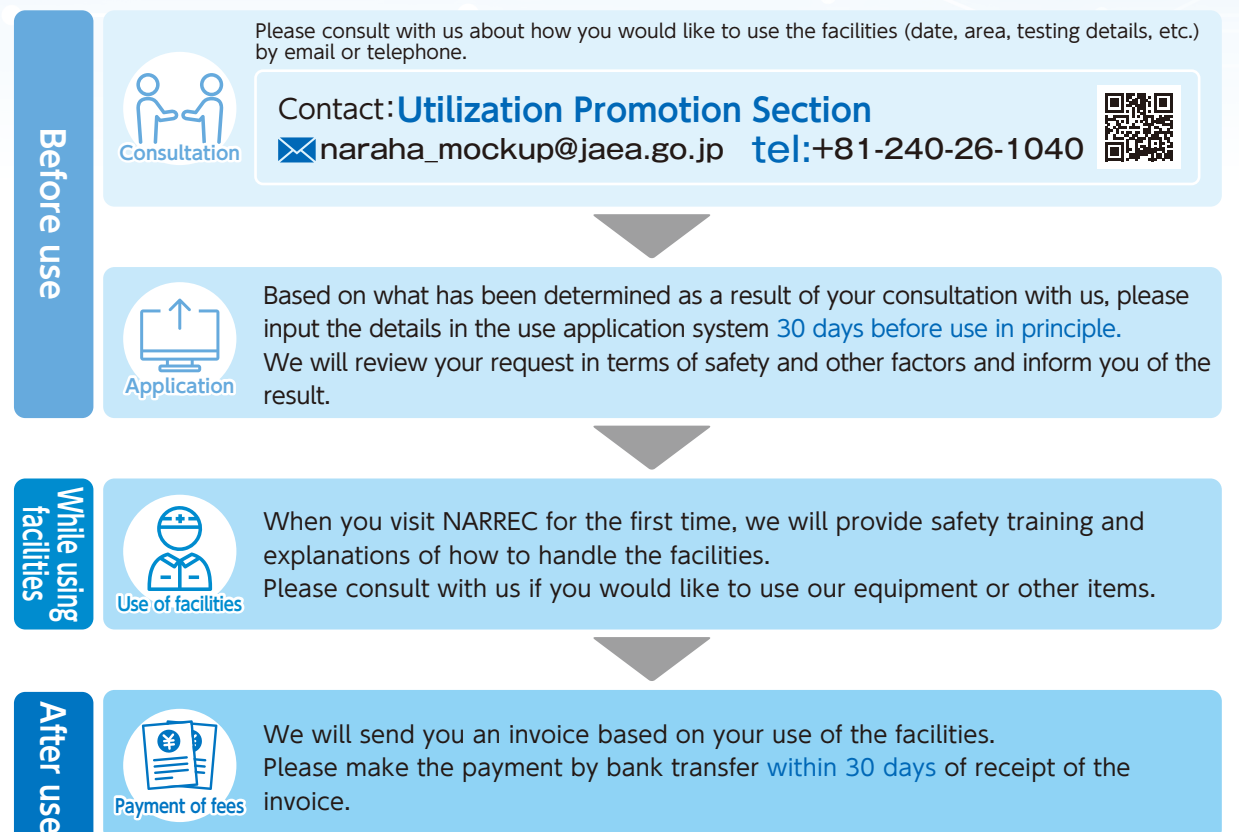


### Participation in local events

We take part actively in local events so that local residents get to know about NARREC.

# How to use NARREC

## Procedure for using the facilities Please consult with us in advance about your intended use before applying.



\* Applications for using the facilities are contract-based. Please be sure to read the contract. (You can view the contract on our website.)

## Usage fees The fees for using the facilities are as indicated in the table below.

The usage fees include the fee for support given when operating the facilities. You can also use various types of attached equipment such as the crane, forklift, measuring instruments and machine tools.

Fees for using facilities		+	<ul style="list-style-type: none"> <li>● Handling fee (900 yen for each usage)</li> <li>● Actual cost of use (actual cost of electricity, water supply, etc. used in tests)</li> </ul>	=	Usage fee
<b>Motion Capture</b> 1-day use costs: Approx. <b>20,000yen</b>	<b>Test Pool</b> 1-day use costs: Approx. <b>5,000yen</b>				<b>Robot Operation Training Program</b> 1 class of 40 people participating in 2 courses costs: Approx. <b>10,000yen</b>
					<b>Multipurpose room</b> 3-hour use for a seminar costs: Approx. <b>20,000yen</b>

\* The fees indicated above are examples. A special measure that exempts you from paying a half of the usage fee may apply if you use the facilities as members of a higher education institution or a small- or mid-size enterprise or for the decommissioning of 1F or the Fukushima Innovation Coast Framework. For details of the usage fees, visit our website or contact us individually.