F-REI

Fukushima Innovation Coast Framework

FUKUSHIMA ROBOT TEST FIELD

Fukushima Robot Test Field

<Robotics Test and Demonstration Facility>






For Usage・Contact details

Public Interest Incorporated Foundation

Fukushima Innovation Coast Promotion Organization

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Minamisoma City Reconstruction Industrial Park

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https://rtf.f-rei.go.jp/

Fukushima Innovation Coast Promotion Organization

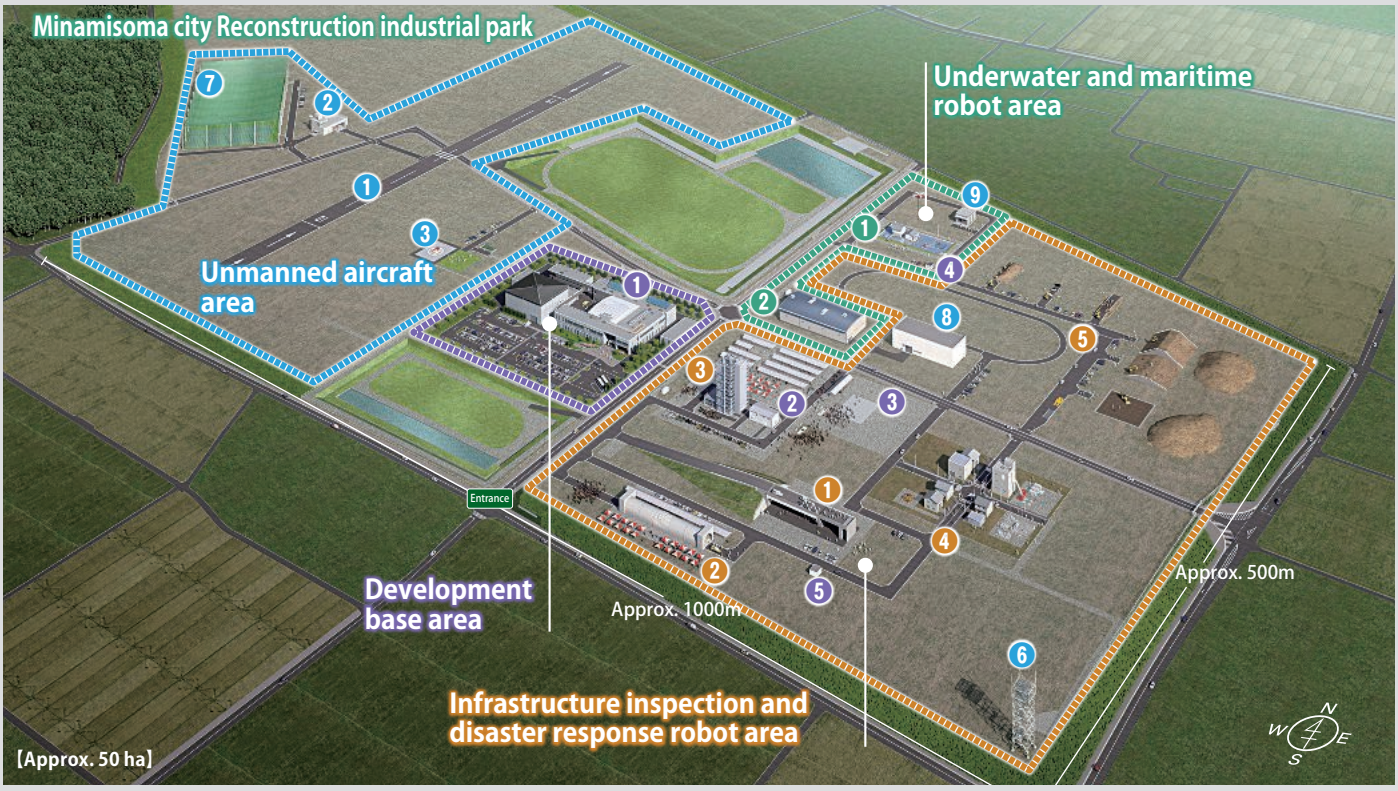
RTF's official character "RoTeFie"

Fukushima Robot Test Field

Fukushima Robot Test Field(RTF), developed based on Fukushima Innovation Coast Framework, is one of the largest research and development bases in the world.
At this research base, verification test, performance evaluation and operation training can be carried out while reproducing the actual operating conditions, mainly for ground, maritime, underwater and aerial robots that are expected to be utilized for logistic, infrastructure inspection and large-scale disaster.
RTF was opened in March 2020. It has two sites, i.e. Minamisoma site and Namie site. Minamisoma site has unmanned aircraft facilities, infrastructure inspection and disaster response robot facilities, underwater and maritime robot facilities, and development base facilities, within the reconstruction industrial park in Minamisoma City.
The size of the site is approx. 1000 m from east to west and approx. 500 m from north to south.
Namie site has a runway and a hanger in Namie Town Tanashio industrial park.
Long distance flight tests can be conducted between Minamisoma site and Namie site.
In 2021, the competition of infrastructure and disaster response of the World Robot Summit held at this base.

Fukushima Innovation Coast Framework

The Fukushima Innovation Coast Framework is aiming to restore industries in the coastal region of Fukushima which were lost due to the Great east Japan Earthquake and nuclear disaster. It also incorporates a national project which seeks to build a new industrial base in the region. Under the framework, we are working on industrial clustering, human resource development, and expansion of migrant population dynamics, as well as promoting the implementation of projects relating to nuclear reactor decommissioning, robotics, energy development, agriculture, forestry, and fisheries industries.



Unmanned aircraft area

Fukushima Robot Test Field has the largest flight airspace, runway, and airfield with impact absorption net in Japan for unmanned aircraft to provide an environment that enables basic flight test and other various tests such as collision avoidance, forced landing, falling, and long-distance flight, and promotes the practical application of unmanned aircraft.

❶ Minamisoma runway　❷ Hangar
❸ Heliport

These facilities are used for flight tests and operation training for unmanned aerial vehicles. Special flight test such as collision avoidance, forced landing, falling, or object dropping can be conducted in the buffer zone. The hangar has a measurement room that can overlook the entire area and an antenna mount are equipped. Heliport can be used for unmanned and manned VTOL type aircraft.

【❶Runway】
- Runway …… 500m×20m (Asphalt pavement)
- North-south direction
- Buffer zone …Width : 200m(including runway)
- Electric Power outlets, LAN ports near runway

◎runway　24,200JPY

【❷Hangar】
- Total floor space…Approx. 558 ㎡, Steel construction, and 2 stories
- Measurement chamber……66.5 ㎡ 2F
- Maintenance room……64.4 ㎡ 1F
- Hangar……314.1 ㎡ 1F
- Door size……W10m×H4.2m
- Antenna installation base……Roof
- Restroom

◎measurement chamber　6,400JPY　◎maintenance room 6,400JPY
◎hangar 18,500JPY　◎hangar (when using half space) 10,500JPY

【❸Heliport】
- Heliport size…25m×20m (Concrete pavement)
- Apron……25m×23m (Lawn Ground)
- Fuel strage ……Concrete block construction 12m×6m×1.2m

◎Heliport　6,300JPY

◎Facility and Equipment Use Fee　Half-day fee (9:00 to 13:00 or 13:00 to 17:00)

❹ Namie runway ❺ Hangar

In contrast to the Minamisoma runway which runs north-south the Namie runway runs east-west allowing for takeoff directly over the sea.

【❹Runway】
- Runway……400m×20m (Asphalt pavement)
- East-west direction
- Buffer zone……Width 100m (including runway)
- Electric Power outlets, LAN ports near runway

◎runway 18,300JPY

【❺Hangar】
- Same spec as Minamisoma Hangar

◎measurement chamber 6,500JPY
◎maintenance room 6,600JPY
◎hangar 19,500JPY
◎hangar (when using half space) 11,000JPY

❻ Communication tower / The wide flight area

Through individual consultation, a flight course over land and sea can be approved for the approx. 13km distance between Minamisoma City and Namie Town. Long distance and wide area flights can also be carried out.
Communication towers installed near both bases secure flight safety over a wide area by ensuring communication, measuring low wind direction and speed, and detecting objects such as manned aircraft and birds.

【Communication tower】
- Height:30m
- Wide area communication antenna (brought-in is allowed)
- Surveillance radar
- Meteorological Observation System (Measurement range 6km, direction wind speed of altitude 30m, 50m, 100m, wind 150m), wind speed of 5m above ground, temperature and humidity.

◎installation of carrying-in equipment 3,300JPY

【Surveillance radar】
■High-resolution type radar spec
- Monitoring range……360 degrees
- Azimuth resolution…Less than 0.5 degrees
- Distance resolution.……less than 25m
- Target speed resolution capacity ……1 m/s or less (Motion path, Trackable)

◎Surveillance rader 9,000JPY

■Detection size and maximum detection distance by a radar
- An object to be detected……20 cm²: 3.5km *
  ……50 cm²: 5 km *
  ……500 cm²: 10 km *

* The maximum detectable distance is a calculated from a value in free space. This distance varies based on the conditions of the instruments and weather. Update time: 5 seconds.

【Meteorological Observation System (Lidar spec)】
■Measuring performance
- Measurement interval of wind direction and wind velocity……5min
- Mesh resolution…500 meters square
- Measurement range of azimuthal angle and distance…270 degrees, radius of 7 kilometers
- Measurement altitude…30 m, 50 m, 100 m, 150 m

※Please contact us for the actual range because it is described in the device spec.

◎meteorological observation system 14,900JPY

❼ Airfield surrounded by net

This airfield is non-applicable to Civil Aeronautics Act, whose upper and surrounding parts are covered with net. Evaluation tests such as basic flight performance and autonomous control of unmanned aerial vehicles, flight training, and night flight and object dropping can be performed under an outdoor environment involving wind and rain or sunshine, without making any legal application in advance.

- 150m×80m×height 15m
- Long pile artificial grass
- Lighting, electric power outlets, LAN ports
- Net ……High strength and high weathering polyolefin gap ⌀2.4×120 ㎜

◎Airfield surrounded by net 55,600JPY
◎when using half space 29,100JPY
◎when using 1/3 space 20,200JPY

【Receiving net for Unmanned aerial vehicle】
- Φ……20m
- height……5-10m
- Load-bearing……50kg※

※Depending on the experimental conditions. Please contact us.

◎Receiving net for Unmanned aerial vehicle 24,200JPY

❽ Wind tunnel

The aerodynamics, flight performance, and stability of the aircraft against gusts and pulsating winds against unmanned aerial vehicles can be tested.

- Floor space……900 ㎡ Steel construction flat house
- Wind tunnel test device(including table and protective net)
- Overhead traveling crane (4.8t)
- Cross sectional area……3m×3m

※Please contact us for more details of measuring range.

- Wind speed……20m/s max.
- Wind speed distribution……less than ± 15% at more than 10m/s (air outlet)
- Turbulence value……less than ± 10% at more than 10m/s (near the center of the air outlet)
- Windstorm performance……Within 3 seconds at 8m/s – 20m/s
- Pulsating performance……Within the cycle of 5 seconds at 10m/s – 20m/s
- Speed stratification performance……Velocity gradient to the vertical direction

【Drone analyzer】
A robotic measuring instrument of the drone's performance, capable of measuring without flight.
- Type……Articulated robot
- Drone Weight……150kg max.
- Drone Diagonal Wheelbase……5,000㎜max.
- Number Of Drone Motors……16 max. (including contra-rotating motors)
- Number Of Drone Arms……16 max.
- Battery Range……22.2V - 44.4V
- Limitation Of The Lift……3kN max.

◎Wind tunnel ※Charges will be incurred when using wind tunnel test device. 185,000JPY
◎Equipment attached to wind tunnel (Analyzer for Unmanned aerial vehicle) 51,700JPY (Infrared Thermography) 1,200JPY

❾ Durability test site

This facility is the test space covered with concrete,for the long-term continuous operation durability test for unmanned aircraft safely.

- Floor space……119 ㎡・ reinforced-concrete construction flat house
- Test space……10m×9.5m×Height 5m
- Door size……W5m×H4m

◎Durability test site 13,100JPY

Underwater and maritime robot facilities

This is the only test site in Japan for the demonstration test by robot, regarding underwater infrastructure inspection and disaster response.
These facilities can reproduce conditions occurring in the water such as dams, rivers, submerged urban areas, or harbors.

① Submerged urban field

This field can reproduce conditions of submerged city with flood damage. It can be used for information gathering, search/rescue training and etc. by water- surface and underwater robot and unmanned aerial vehicles. It can also be used for testing under conditions where objects and obstacles are sunk, rescue training with manned helicopters or boats.

- 50m×19m×water depth 0.7m Outdoor water tank (of which 10m x 10m:water depth 5m)
- Submerged house A …… 53㎡ The partial 1st floor is submerged
- Submerged house B …… 53㎡ The whole 1st floor is submerged
- Outdoor plug socket board
- Telegraph pole, Electricwire

◎Submerged urban field 14,900JPY ◎Submerged urban field (Excluding building) 11,000JPY

② Indoor water tank

This facility reproduces conditions of dams, rivers, and harbors to perform tests and maneuver training on inspection and investigation with the underwater/water-surface robot. The large water tank is equipped with a test piece simulated an aging underwater structure, and enables installation of inspection objects, generating water flow, reproducing the dark places. In a small water tank, the performance on observation instruments to be installed can be tested by controlling the turbidity.

- Floor space……1,456㎡ ・ Steel construction, Flat house
- Carry-in entrance……W3.5m×H3.4m

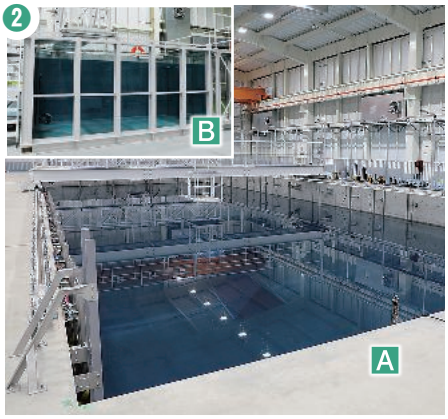
A Large water tank
- 30m×12m×water depth7m
- Water flow generation device
- Brightness adjustable
- Restroom, changing room
- Movable observation stand
- Overhead traveling crane (4.8t)
- Water tank measurement room 12.2㎡

【Appendage】
- Panels for inspection test : 310x310mm, 184 numbers, 2mm or 5mm scratches of concretes, indended suface of concretes, rusts of grating array, resolution test chart (ISO 12233)

◎large water tank 72,100JPY ◎Water flow generation device (for Large water tank) 15,100JPY
◎crane 1,300JPY perhour ◎measurement room 3,000JPY ◎Test piece (for large water tank) 5,600JPY

B Small water tank
- 5m×3m×water depth 1.7m
- Turbidity adjustable
- Movable observation stand, Water flow generation device

◎small water tank 11,000JPY ◎small water tank (when performing a turbidity test) 28,000JPY
◎Water flow generation device (for Small water tank) 3,200JPY



Infrastructure inspection and disaster response robot facilities

This is the only test site in Japan for the demonstration test on infrastructure inspection and disaster response by robot. It is possible to reproduce almost conceivable disaster environment and aging condition in structures such as tunnels, bridges, plants, urban areas and roads.

① Mockup bridge

This is a bridge of four different types made of steel and concrete that reproduces aging. It can be used for testing and operation training related to the condition check and inspection.
It reproduces the objects to be inspected such as cracking/peeling/flaking on concrete and looseness on steel bolts.
There are also objects of hindering on inspection, illumination posts, protective fences that may hinder inspection, trusses, or cable tubes can be installed.

- 5G base station (Established by NTT DoCoMo, Inc.)
- Length 50m Road width 10m Bridge girder height 5m
- Steel bridge part
  Steel simple girder length 35m
- Concrete bridge part
  PC simple pretension system T girder bridge and the same floor slab bridge length15m

【Appendage】
- Mockup light column, flexible guard fence, rigid guard fence
- Mockup trusses, mockup failure prevention devices, mockup inspection paths, mockup mounting pipes
- Outdoor plug socket board

【Inspection object】
- Cracking・Peeling・flaking of the concrete, loose bolt・crack of Steel material

◎Mockup bridge 29,700JPY

② Mockup tunnel

This tunnel reproduces the wall peeling and aging. It can be used for testing and maneuvering on situation confirmation, search, debris removal, aging inspections. On its wall, it is equipped with lighting equipment on expressways and ordinary roads (LED light, sodium lamp) and jet fans to reproduce cracking/peeling to be inspected. Inside the tunnel, obstacles such as vehicle, rubble, rock, or gravel can be placed, and the shutters on both sides can be closed to reproduce the central part of a long tunnel.

- 5G base station (Established by NTT DoCoMo, Inc.)
- Length of 50m (Barbed concrete section 40m,Plain concrete section 10m) ,road width of 6m
- Inner section
  …… W8.8m×H6.36m

【Appendage】
- LED light, sodium lamp
- Mockup jet fan
- Mockup fire-hydrant
- Water supply port
- Induction display board
- Water drain
- Plug socket board

【Inspection object】
- Cracking of the concrete
- Flaking
- Deficiency of thickness of tunnel wall

◎Mockup tunnel 26,400JPY

◎Facility and Equipment Use Fee Half-day fee (9:00 to 13:00 or 13:00 to 17:00)

❸ Mockup plant

This facility reproduces plants at normal/disaster situation to perform tests and maneuvering training on inspections, information gathering and equipment operation. This facility has been installed plumbs, valves, ducts, stairs, spiral stairs, catwalks, vertical ladders, tanks and chimneys in various shapes. Abnormal environments can be reproduced, by changing/blinking instruments and indicators, filling smoke or gas, and arranging heat sources and debris.

- 5G base station (Established by NTT DoCoMo, Inc. And KDDI.Inc.)
- Steel construction 6 stories (height 30m)
  Each floor approx.130 ㎡
  Elevator for cargo(H2.0m×W4.5m weight upper limit 2.1t)
- 5th and 6th floor
  3 chimneys(⌀ 3m, ⌀ 2m, ⌀ 1m) and vertical ladder are installed.
  The 5th and 6th floor total space 197.08 ㎡
- 3rd and 4th floor
  Mockup tank (3rd floor r 2.8m, 4th floor r 1.8m) and vertical ladders and spiral stairs are installed.
  3rd and 4th floor each space127.82 ㎡
- 2nd floor
  Piping (SGP500A,300A,200A, 100A,50A,PVC200A,50A)Gate Valve, pressure gauge, View station, duct
- 1st floor (2 sections)
  Piping (SGP200A,150A, 100A,80A,50A)
  A Mock up boiler B Pump C Tank
  Slope, ball valve, gate valve, butterfly valve, pressure gauge, water level gauge


3rd floor


5th and 6th floor


1st floor C


2nd floor


1st floor A


1st floor B

◎1F (when using half space) 14,100JPY ◎2F 13,900JPY ◎3F 10,900JPY ◎4F 10,200JPY ◎5F / 6F 16,800JPY

❹ Urban field

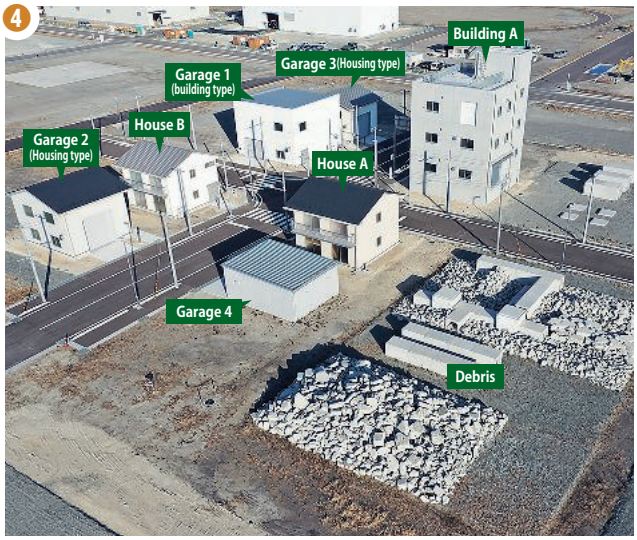
In this field, houses, buildings and intersections with traffic light/road sign are arranged to reproduce the condition of city area. Vehicles, debris, and objects to be inspected are placed inside/outside the buildings to perform information gathering, investigation, obstacle removal, search and rescue of personnel, and inspection testing and maneuvering training. It can also be used for running tests using concrete and wood debris, bleaching training on building walls and floors, and automatic driving tests using road parts.

- 5G base station (Established by NTT DoCoMo, Inc.)
- Building A ····· Reinforced concrete construction, 3 stories, each floor 100㎡
  Telpher crane (1.5t)
- House A ····· Wooden construction, 2 stories, each floor space 53㎡(Simulate the inside house and simulate damage)
- House B ····· Wooden construction, 2 stories, each floor 53 ㎡ (simulates the inside house)
- Garage 1 (building type) ····· Steel construction, 1 story, 110㎡ Inside can be used as a warehouse
- Garage 2 (Housing type) ····· Steel construction, 1 story,56㎡ inside can be used as a warehouse
- Garage 3 (Housing type) ····· Steel construction, 1 story,56㎡ inside can be used as a warehouse
- Garage 4 ··· Light gauge steel construction, 1 story, 47 ㎡ Inside can be used as a warehouse

【Road】
- North-south direction
  Length 75m Width 12m (including sidewalks)
- East-west direction
  Length 96m, width 7.5m (including the sidewalk)
- Telegraph poles, road signs, lights, traffic lights, etc.

【Debris】
- Concrete culvert (32 Pieces)
- Bleaching panel (9 pieces)
- Concrete Debris

◎Building A, House A, House B, Road, Debris 30,500JPY ◎Building A 9,500JPY ◎House A 5,800JPY
◎House B 6,000JPY ◎Garage 1 (Building type) 9,900JPY／All day ◎Garage 2 (Housing type) 7,800JPY／All day
◎Garage 3 (Housing type) 7,200JPY／All day ◎Garage 4 5,700JPY／All day ◎Road 15,800JPY ◎Debris 3,500JPY



❺ Debris/landslide field

This facility reproduces the road interception site at the time of disaster and the landslide site. It can be used for testing and operation training on unmanned construction heavy equipment and robot status confirmation, search and rescue, and restoration work. It has a soil slope reproducible at 15 or 30 degree, muddy grounds with adjustable softness, and a circuit for running durability test, as well as various obstacles that can be placed on the road.

【Circuit】
- Length 400m, width 4m, (asphalt pavement)

【Soil slope】
- Inclination 30° ···30m×30m, height approx. 7m
- Inclination 15° ···30m×30m, height approx. 3m

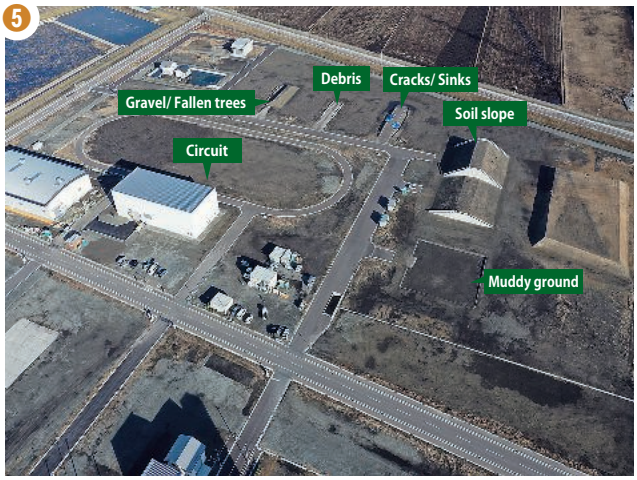
【Cracks/ Sinks】
- Length 20m , width 7.6m, (asphalt pavement)
- Road collapse/Road crack

【Muddy ground】
- 30m×30m depth 0.3m

【Debris】
- Length 20m, width 6m, (asphalt pavement)
- Concrete block/ Vehicles

【Gravel/ Fallen trees】
- Length 30m, width 6m, (concrete pavement)
- Soil, rock, approx.10 fallen trees

◎Gravel/fallen trees, Debris, Crocks/Sinks, Soil slope, muddy ground, Circuit 21,000JPY
◎Gravel / fallen trees 3,600JPY ◎Debris 3,000JPY ◎Crocks / Sinks 3,900JPY
◎Soil slope 13,900JPY ◎muddy ground 3,700JPY ◎Circuit 5,100JPY



Development base facilities

❶ Research building

This facility is the main building of Fukushima Robot Test Field, where can use for various tests against wind, rain, waterproof, dustproof, fog, water pressure, temperature, humidity, vibration, and radio wave about performance evaluation of robot. It also can use for preparation,processing and measurement for each test.
This facility can be used as a short/long term base for researchers, an office, and hold a large-scale conference or an exhibition.
In addition, Fukushima Technology Centre Minamisoma Technical Support Centre, installed in the ward, will provide equipment support,technical consultations and development support.

- Floor space : approx. 5,200 ㎡
- Total floor area : 7,000㎡
- Reinforced concrete construction(2stories)
- Parking area for approx. 165 cars

■Laboratory
- 30 – 60 ㎡ 20 rooms
- office desk 2, office chair 2, Bookshelf 1 (laboratories 1 – 13 are equipped a mini kitchen.) (Room 201-204 can also be used as conference rooms.)

■Conference room
- Conference room 1 … 49.3㎡ [for20-40people]
- Conference room 2 … 46.6㎡ [for20-40people]
- Conference room 3 … 46.5㎡ [for20-40people]
- Room201(Conference room)…47.7㎡
- Room202(Conference room)…48.8㎡

■General control room
- For operation management while looking at the unmanned aircraft facilities

■Indoor examination-place
- Floor space 32×30m
- Ceiling height 11 m
- Overhead travelling crane 2t
- Epoxy resin type floor covering on floor concrete
- Carry in entrance W7m×H4.1m
- Pressure test equipment

■Courtyard
- Courtyard with half roof(36×18m) can use for test preparation

■Conference hall・Foyer
- Conference hall … 173.1㎡ [for180people (theater type)]
- Foyer … 70.5㎡

■Room 101 and 102 (Laboratory/Development laboratory)
- 2 room(For short-term stay, 40 ㎡)
- single phase 100V,single phase 200V

■Instrument Analysis Room/Precision Measurement Room/Dust test room

■Processing room

■Environmental measurement room

■Anechoic chamber

■Vibration test room
- Telpher crane (1t)

■Test room for wind resistance・rainfall/Waterproof test room

■Rental warehouse/Depository
- 30 – 100㎡ 15 rooms
- 2ton overhead travelling crane (only in Depository)
- Carry in entrance W2, 690 mm/3, 790 mm/ 4, 300 mm x H4, 100 mm
- Epoxy resin type floor covering on floor concrete

■Management office

■Shower room

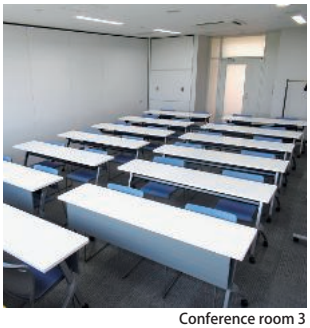
■Mini workshop, electronic control room

◎Conference room 1 5,600JPY ◎Conference room 2 5,400JPY
◎Conference hall 14,100JPY ◎Indoor examination place 50,300JPY


Conference hall・Foyer


Conference room 1・2・3


Conference room 1


Conference room 3

❷ Test Preparation Building
❸ Outdoor test pad
❹ Measurement shed A
❺ Measurement shed B

For Preparation of test and maintenance of robot

【❷Test Preparation building】
- Steel framed structure 2 stories,approx.220㎡
- maintenance room … 70.7㎡
- Preparatory office 1 … 45.0㎡
- Preparatory office 2 … 74.6㎡
- Restroom

【❸Outdoor test preparation place】
- 20m×25m (Concrete pavement)

【❹Simple measurement room A ❺Simple measurement room B】
- Light gauge steel construction, Flat house, Floor space 24.3 ㎡
- Office space 16.8 ㎡, restroom , kitchen
- Refrigerator, electric kettle, microwave oven

◎Maintenance room 7,000JPY ◎Preparatory Office 1 5,700JPY
◎Preparatory Office 2 7,500JPY ◎Outdoor test preparation place 4,300JPY
◎Simple measurement room A 6,100JPY ◎Simple measurement room B 6,900JPY

◎Facility and Equipment Use Fee Half-day fee (9:00 to 13:00 or 13:00 to 17:00)

Equipment list

※ In this list, robot test field staff is in charge of the items marked with ●, Fukushima Technology Centre, Minamisoma Technical Support Centre staff is in charge of the other items.

Physical properties equipment	Type	Spec
Vickers hardness tester	HMV-G21DT	Sample stage space : 100mm×100mm Sample height capacity : 100mm max. Ability : 98.07mN – 19.61N
Rockwell hardness tester	RMT-1	Sample height capacity : 200mm max. Sample depth capacity : 165mm max. Ability : 588.4N, 980.7N, 1471N
Universal material testing machine	AG-100KNXPlus	Load capacity : 100kN max. Effective test width : 930mm Crosshead movement : 1,330mm (Without jig)

Machining equipment	Type	Spec
Machining center	VARIAXIS j-600/5X AM Wire arc metal lamination	Movement : 850mm (X axis), 550mm (Y axis), 510mm (Z axis), -120 – 90° (B axis), 360° (C axis) Lamination method : Wire arc metal lamination Laminatable metal : Aluminum, Stainless steel, Mold steel, Heat resistant alloy, etc.
NC milling cutter	KE55	General purpose operation, Machining guidance operation and NC program operation are available Movement : 550mm (X) ×320mm (Y) ×350mm (Z) Table size (work space) : 800mm×375mm Spindle rotational speed : 40 – 4,000rpm
Semi-automatic lathe	TAC-360	General purpose operation, Interactive input operation, Machining by CNC programming are available Distance between both centers : 770mm Spindle speed range : 60 – 2,000rpm
Drilling machine	B 23S	Processing capacity : ⌀23mm max. Spindle rotations : 2,400rpm, 1,320rpm, 830rpm, 400rpm
Contour machine	VZ-300SA	Cutting ability : 200mm (H) × 300mm (D) Table stroke : 250mm
High-speed cut-off machine	HS-100G2	Standard cutting ability : 45mm (Pipe material), 40mm(Solid material), Plate material (20mm×75mm)
Shearing machine	AST-1313	Cutting thickness : 13mm (approx. SS400 equivalent) Cutting length : 1,280mm
Cutting dynamometer	9139AA	Measuring range (when loaded on a plate) : ±30kN (Fx,Fy,Fz), ±3,000N・m (Mx,My,Mz), Top plate : 140mm×190mm
Double-headed grinder	FG255T	Grinding wheel outer diameter : ⌀255mm × 25 mm (thickness) rotational speed : 1,500 rpm
Belt grinder	FS-2N	Belt width : 100 mm Belt speed : 17.2 m / s (50 Hz)
3D printer (1)	L-DEVO F300TP	Fabrication method : Fused deposition method Fabrication size (mm) : 310(W)×310(D)×450(H) Fabrication material (example) : H-PLA、ABS
3D printer (2)	F170	Fabrication method : Fused deposition method Fabrication size (mm) : 254(W)×254(D)×254(H) Fabrication material (example) : PLA, ABS Support material : WaterWorks soluble support method
LMD Metal 3D Printer	Lasermeister 101A	Fabrication method : LMD method Fabrication size(mm) : ⌀150×150(H) Fabrication material : SUS316L、SKH51、INCONEL718
Precision surface grinding machine	PSG52SA1	Chuck size (mm) : 500×200 Wheel speed : 1000~3600rpm

※ In this list, robot test field staff is in charge of the items marked with ●, Fukushima Technology Centre, Minamisoma Technical Support Centre staff is in charge of the other items.

Material processing equipment	Type	Spec
Sputtering device	MC1000	Film forming material : Pt, Pt-Pd, Au, Carbon
Sample polishing system	Ecomet300 pro / Automet300	Polishing plate size : 10 inch　Polishing plate rotation speed : 50 – 400rpm

Analytical equipment	Type	Spec
Scanning electron microscope	S-3700N	Elements can be analyzed : B – U　Magnification : 15 x – 300,000 x　Sample size : ⌀300mm max.
Measuring microscope	MF-UK4020D	Measurement range : 400 mm × 200 mm, Height of test object : 220 mm max.　Observation mode : bright field, dark field, differential interference, simplified polarization　Measurement accuracy : (2.2+0.002L) μm
Fourier transform infrared spectroscopy system	Spotlight200i-DTGS SpectrumTWO	Measurement wave number range : 8,300 – 350cm-1、7,800 – 400cm-1 (Microscopic)　Detector : LiTaO3、DTGS (Microscopic)
Energy dispersive X-ray fluorescence analyzer	EA6000VX	Measurement element：Na(11) – U(92)　Tube voltage and current：50kV (Variable) /20 – 1,000 μA　Irradiation type : Top vertical irradiation
Stereomicroscope	S9i	Magnification range : 6.1x – 55x　Built-in camera : 10 million pixel color
FFT analyzer	CF-9400	Number of channels : 4　Frequency range : DC – 100kHz　A / D converter : 24 bit ΔΣ type
Digital microscope	VHX-7000	CMOS image sensor Number of pixels: 3.19 million pixels,　Objective lens magnification: 20 ~ 6000x,　Zoom lens magnification: 20 ~ 200x,　Stage size: 100mm x 100mm

Electro mesurement equipment	Type	Spec
Oscilloscope	Wave Runner 8254-MS	Analog band width : 2.5 GHz　Channel : 4 ch (analog), 16 ch (digital)　Waveform analysis tool : Serial trigger, decode, measurement/graph, eye pattern
Data logger	GL980	Sampling interval : 1 μs - 1 min　Possessed probe : K type thermocouple, temperature sensor　Channel : 8 ch　Recordable time : 4 seconds (1 μs) - 1 year or more (1 s)
Radar evaluation equipment	DSO5804A	Measurable frequency : 75 GHz - 83 GHz (using block down converter)　Analysis function : Digital modulation analysis, FMCW Radar analysis, pulse radar analysis
Signal analyzer	FSW43	Frequency range: 2Hz ~ 43.5GHz, real-time spectrum analysis width: 800MHz, I/Q analysis bandwidth: 1.2GHz
DC stabilized power supply (18V specification)	DC30-36	Output rating (Voltage : 30V　Current : 36A　Power : 360W)
DC stabilized power supply (60V specification)	DC80-27	Output rating (Voltage : 80V　Current : 27A　Power : 720W)
AC stabilized power supply (single-phase specification)	DP015S	Power capacity : 1.5kVA　Rated Output Voltage : 100V/200V　Current : 15A/7.5A max.　Frequency Setting Range : 40Hz – 550Hz
Digital multimeter	34470A	Resolution : 7 1/2digit,　DC voltage (range : 100mV – 1,000V, resolution : 10nV min.),　AC voltage (range : 100mV – 750V, resolution : 10nV min., frequency band : 3Hz – 300kHz) ,　Resistance (range : 100Ω – 1GΩ, resolution : 10 μ Ω min.) ,　DC current (range : 1 μ A – 10A, resolution : 100fA min.),　AC current (range : 100 μ A – 10A, resolution : 10pA min., frequency band : 3Hz – 10kHz)
Impedance analyzer	65120B	Measurement frequency range : 20Hz - 120MHz Measurement range : 0.01mΩ - 2GΩ,　measurement parameters : Z, θ, C, D, L, Q, R, X, G, B, Y　fixture : for lead parts, for chip parts, for thin films
Field test system (Handheld Microwave Analyzer)	N9950A	CAT / VNA frequency: 300 kHz ~ 32 GHz, spectrum analyzer frequency: 9 kHz ~ 32 GHz optional functions: power meter, channel power measurement, real-time spectrum analysis, I/Q signal analysis, etc.
Network analyzer	E5061B	Frequency range: 5Hz ~ 3GHz, options: gain / phase test port, impedance analysis function, various test fixtures
Arbitrary waveform generator	WF1968	Number of channels: 2Ch, frequency: 0.01 μ Hz ~ 200MHz (sine wave), sampling rate: 420MSa/s, modulation method: FM, FSK, PM, PSK, AM, DC offset, PWM

Dimensions・shape measurement equipment	Type	Spec
X-ray CT scanner	TOSCANER-24500AVFD	X-ray tube output : 450kV / 3.3mA max.　Line detector /flat panel detector switchable　Scan area : ⌀600 mm × H 1,000 mm
CNC 3-D measuring machine	STRATO-Apex9166	Measurement range : 900mm (X axis) 1,600mm (Y axis) 600mm (Z axis)　Measurement error range : E0,MPE=0.9 +2.5L/1,000 (μ m)
Measuring machine for Surface coarseness and Outline shape	SV-C4500L8	Measurement range : 200mm (X axis (drive unit)) 60mm (Z1 axis (detection unit))
Non-contact 3-D digitizer	ATOS Compact Scan 12M	CCD camera pixel number : 12 million pixels × 2　Measurement range : 170mm×130mm×110mm, 390mm×290mm×250mm, 700mm×500mm×500mm
Accuracy evaluation system of machine tool	QC20-W	Test and analyse based on JIS B6190-4　Test based on JIS B6336-6

Environmental equipment	Type	Spec
● Pressureproof test equipment	—	Pressurize by water.　Pressure : 2.2 MPa max.　Container size : ⌀1.5 m , 1.5 m(H)
● Earthly affairs test device	DTS-2019-SP5	Can test based on　IP5X, IP6X　Tank size：1,500(W)×1,500(D)×1,000(H) mm　Sample weight：150kg max.
Temperature and humidity testing chamber	EC-16MHHP	Tank size : 500mm (W) ×380mm (D) ×630mm (H)　Temperature range : -40 – 150℃　Humidity range : 20 – 98%RH
Decompression Temperature and humidity testing chamber	ALT-7018-3400-HW	Tank size : 1,500mm (W) ×1,500mm (D) ×1,500mm (H) Temperature range : -70 – 180℃ (Atmospheric pressure) -70 – 140℃ (Below atmospheric pressure – 33.4kPa) Humidity range : 20 – 95%RH (Atmospheric pressure) 20 – 85%RH (69.7kPa) Pressure control range : 10.7 – 101kPa (Absolute pressure)
Thermal shock testing equipment	ES-77LH	Tank size : 410mm (W) ×360mm (D) ×490mm (H)　Temperature range : -70 - 0℃ (Low temperature exposure), 60 - 200℃ (High temperature exposure)
High acceleration life testing equipment	PC-422R8	Tank size : 420mm (⌀) ×485mm (D)　Temperature range : 105.0 – 133.3℃ (100%RH) 110.0 – 140.0℃ (85%RH) 118.0 – 150.0℃ (65%RH)　Humidity range : 65 – 100%RH　Pressure range : 0.019 – 0.208MPa
Drying furnace	VTEC-216-H	Tank size : 600mm (W) ×600mm (D) ×600mm (H)　Temperature range : 60 – 300℃
Two axes reshuffling vibration testing equipment	VTS-60ES-2 ／ 150 Type	Testable waveform : Sine wave (Steady, Sweep : linear/logarithm), Random wave　Test frequency range : 3Hz – 200Hz　Acceleration : 49m/s² max.　Loading : 500kg max.　Table size : 1,500mm×1,500mm
Single axis vibration testing equipment	FC-080K ／ 60 Type	Testable waveform : Sine wave (35kN), Random wave (35kNrms), Shock wave (87.5kN) Test frequency range : DC – 2,000Hz　Acceleration : 889m/s² max. (Sine wave no load), Loading : 500kg max.　Available for combined test
Tempurature and humidity testing chamber (Compound test)	VC-102DWMX (32) P3G-H/V	Tank size : 1,000mm (W) ×1,000mm (D) ×1,000mm (H)　Temperature range : -40 – 150℃　Humidity range : 30 – 98%RH
● Waterproof test equipment	IPX-3456-TBSP	Can test based on IPX3, IPX4, IPX5, and IPX6
● The rain・drizzle test device	FRTF-HRS200V-180	Precipitation 10-180mm/h　Drizzle approx 3mm/h　Particle size (raindrop diameter) : approx. ⌀1mm, approx. ⌀3mm　Rainfall range : 4m×4m×Height 4m
● Wind-resistant test device	Jet GYM GRL-8041	Fan diameter : ⌀800mm　Wind speed and reach distance : 5m/s(20m)　1.5m/s(70m)

Anechoic chamber	Type	Spec
Anechoic chamber	3m Radio anechoic chamber	Space : 8.5m (L) ×5.0m (W) ×5.6m (H) Turntable : ⌀2.0m　Antenna lift range : 1 – 4m Measurable frequency band : 30MHz – 18GHz
3-D radiation pattern measurement system	—	Measurement frequency range : 700 MHz – 6 GHz　Rotation range : Measurement by gantry (horizontal; 360°, vertical : ±165°)　Measurement coordinate system : Spherical coordinates
TRP/TIS measurement system	—	Communication method : LTE (FDD), TD-LTE, IEEE802.11 b/g/a/n/ac, etc.
GNSS receiving system sensitivity evaluation system	—	Supported satellite : GPS, QZSS, Galileo, etc.
Multipath phasing evaluation system	—	Test frequency range : 380 MHz – 6 GHz　Phasing pattern : Rayleigh phasing
Radiation EMI measurement system	—	Measuring frequency range : 30 MHz – 6 GHz　Applicable standard : CISPR32, VCCI
Radiation immunity test system	—	Test frequency range : 80MHz – 4GHz(Max30V/m), 4GHz – 6GHz(Max10V/m)　Applicable standard : IEC61000-4-3

Other equipment	Type	Spec
● Fume simulator	PS-2006	Smoke ability : 10 – 31m³/min (Variable)　Smoke reach distance : 3m (Windless time)
● Victim simulator	WRR-25	Material : PVC plastic resin　Body weight : 24.9kg±4%　Height : 160cm±5cm
● Outdoor large monitor system	LEDVISION	Monitor size : 4,000mm×2,000mm　Viewing angle : 150 (°Horizontal) 120 (°Vertical) Contrast ratio : 5,000:1 Brightness : 5,000NITS (cd/m²) max.
● Light projector	LS304D	LED energy consumption : 300W × 4 light　Power Generator : 2kVA (50Hz)
● Generator	DGM600MK	Can output simultaneous Three-phase・single-phase three line　Rated output : Three-phase four-line 50 / 60kVA, single-phase three-line 30 / 36kVA　Outlet:6 pieces
● High-speed camera	SA-Z type RX-HK	Color photographing　Pixel number : 1,024×1,024 pixel　Shooting speed (full frame) : 20,000fps max. Shooting speed (Dividedframe) : 2,100,000fps max.
● Picture record system	—	Network camera：4K fixed type and HD image quality fixed type・movable type　Portable camera：4K Handy Type and Small Type　Image recording apparatus : Image of network camera and a portable camera can be edited simultaneously
● Rental tent	KT-60	Size : 3.0m×6.0m×3.4m　Weight : 54kg
● 3D motion capture	OQUS7+	Sampling : 300fps (12 million pixels), 1,100fps (3 million pixels)　Sampling : 10,000fps max.
● Total Station	Nova MS60	Measurement range : 1.5m~2,000m　Precision : 2mm+2ppm/1.5seconds

Fukushima Robot Test Field Facility & Equipment Use Fee List

Unmanned aircraft facilities

Facility / Equipment	Per hour (9:00 to 17:00)	AM / PM (9:00 to 13:00・13:00 to 17:00)	Nighttime (17:00 to 21:00)	Nighttime(Per hour) (17:00 to 21:00)	Extratime (0:00 to 9:00, 21:00 to 24:00)
❶ Minamisoma runway	6,100 JPY perhour	24,200 JPY	29,100 JPY	7,300 JPY perhour	7,900 JPY perhour
❹ Namie runway	4,600 JPY perhour	18,300 JPY	22,000 JPY	5,500 JPY perhour	6,000 JPY perhour

Facility / Equipment	–	All day	AM / PM (9:00 to 13:00・13:00 to 17:00)	Nighttime (17:00 to 21:00)	Extratime (0:00 to 9:00, 21:00 to 24:00)
❷ Hangar attached to Minamisoma runway (measurement chamber)	—	—	6,400 JPY	7,600 JPY	2,100 JPY perhour
❷ Hangar attached to Minamisoma runway (maintenance room)	—	—	6,400 JPY	7,700 JPY	2,100 JPY perhour
❷ Hangar attached to Minamisoma runway (hangar)	—	—	18,500 JPY	22,200 JPY	6,000 JPY perhour
❷ Hangar attached to Minamisoma runway (hangar (when using half space))	—	—	10,500 JPY	12,600 JPY	3,400 JPY perhour
❸ Heliport	—	—	6,300 JPY	7,500 JPY	2,100 JPY perhour
❺ Hangar attached to Namie runway (measurement chamber)	—	—	6,500 JPY	7,800 JPY	2,200 JPY perhour
❺ Hangar attached to Namie runway (maintenance room)	—	—	6,600 JPY	7,900 JPY	2,200 JPY perhour
❺ Hangar attached to Namie runway (hangar)	—	—	19,500 JPY	23,400 JPY	6,400 JPY perhour
❺ Hangar attached to Namie runway (hangar (when using half space))	—	—	11,000 JPY	13,200 JPY	3,600 JPY perhour
❻ Communication tower (installation of carrying-in equipment)	—	—	3,300 JPY	3,900 JPY	1,100 JPY perhour
❻ Equipment attached to communication tower (Surveillance rader)	—	—	9,000 JPY	9,000 JPY	2,260 JPY perhour
❻ Equipment attached to communication tower (meteorological observation system)	—	—	14,900 JPY	14,900 JPY	3,730 JPY perhour
❼ Airfield surrounded by net	—	—	55,600 JPY	66,700 JPY	18,100 JPY perhour
❼ Airfield surrounded by net (when using half space)	—	—	29,100 JPY	34,900 JPY	9,500 JPY perhour
❼ Airfield surrounded by net (when using 1/3 space)	—	—	20,200 JPY	24,200 JPY	6,600 JPY perhour
❼ Receiving net for Unmanned aerial vehicle	—	—	24,200 JPY	24,200 JPY	6,040 JPY perhour
❽ Wind tunnel ※Charges will be incurred when using wind tunnel test device.	—	—	185,000 JPY	222,000 JPY	60,200 JPY perhour
❽ Equipment attached to wind tunnel (Analyzer for Unmanned aerial vehicle)	—	—	51,700 JPY	51,700 JPY	12,910 JPY perhour
❽ Equipment attached to wind tunnel (Infrared Thermography)	—	—	1,200 JPY	1,200 JPY	290 JPY perhour
❾ Durability test site	—	—	13,100 JPY	15,700 JPY	4,300 JPY perhour

Underwater and maritime robot facilities

Facility / Equipment	Per hour (9:00 to 17:00)	All day	AM / PM (9:00 to 13:00・13:00 to 17:00)	Nighttime (17:00 to 21:00)	Extratime (0:00 to 9:00, 21:00 to 24:00)
❶ Submerged urban field	—	—	14,900 JPY	17,800 JPY	4,900 JPY perhour
❶ Submerged urban field (Excluding building)	—	—	11,000 JPY	13,200 JPY	3,600 JPY perhour
Ⓐ Indoor water tank (large water tank)	—	—	72,100 JPY	86,500 JPY	23,500 JPY perhour
Ⓐ Water flow generation device (for Large water tank)	—	—	15,100 JPY	15,100 JPY	3,770 JPY perhour
Ⓑ Indoor water tank (small water tank)	—	—	11,000 JPY	13,200 JPY	3,600 JPY perhour
Ⓑ Indoor water tank (small water tank (when performing a turbidity test))	—	—	28,000 JPY	33,600 JPY	9,100 JPY perhour
Ⓑ Water flow generation device (for Small water tank)	—	—	3,200 JPY	3,200 JPY	790 JPY perhour
Ⓐ Indoor water tank (crane)	1,300 JPY perhour	—	—	—	—
Ⓐ Indoor water tank (measurement room)	—	—	3,000 JPY	3,500 JPY	1,000 JPY perhour
Ⓐ Test piece (for large water tank)	—	—	5,600 JPY	5,600 JPY	1,400 JPY perhour

Infrastructure inspection and disaster response robot facilities

Facility / Equipment	Per month	All day	AM / PM (9:00to13:00・13:00to17:00)	Nighttime (17:00 to 21:00)	Extratime (0:00to9:00,21:00to24:00)
❶ Mockup bridge	—	—	29,700 JPY	35,600 JPY	9,700 JPY per hour
❷ Mockup tunnel	—	—	26,400 JPY	31,700 JPY	8,600 JPY per hour
❸ Mockup plant, 1F (when using half space)	—	—	14,100 JPY	16,900 JPY	4,600 JPY per hour
❸ Mockup plant, 2F	—	—	13,900 JPY	16,700 JPY	4,600 JPY per hour
❸ Mockup plant, 3F	—	—	10,900 JPY	13,100 JPY	3,600 JPY per hour
❸ Mockup plant, 4F	—	—	10,200 JPY	12,300 JPY	3,400 JPY per hour
❸ Mockup plant, 5F / 6F	—	—	16,800 JPY	20,200 JPY	5,500 JPY per hour
❹ Urban field (Building A, House A, House B, Road, Debris)	—	—	30,500 JPY	36,500 JPY	9,900 JPY per hour
❹ Urban field (Building A)	—	—	9,500 JPY	11,400 JPY	3,100 JPY per hour
❹ Urban field (House A)	—	—	5,800 JPY	7,000 JPY	1,900 JPY per hour
❹ Urban field (House B)	—	—	6,000 JPY	7,200 JPY	2,000 JPY per hour
❹ Urban field Garage 1 (Building type)	224,700 JPY	9,900 JPY	—	—	—
❹ Urban field Garage 2 (Housing type)	160,800 JPY	7,800 JPY	—	—	—
❹ Urban field Garage 3 (Housing type)	142,700 JPY	7,200 JPY	—	—	—
❹ Urban field Garage 4	99,200 JPY	5,700 JPY	—	—	—
❹ Urban field (Road)	—	—	15,800 JPY	18,900 JPY	5,200 JPY per hour
❹ Urban field (Debris)	—	—	3,500 JPY	4,200 JPY	1,200 JPY per hour
❺ Debris / landslide field (Gravel / fallen trees, Debris, Crocks / Sinks, Soil slope, muddy ground, Circuit)	—	—	21,000 JPY	25,100 JPY	6,800 JPY per hour
❺ Debris / landslide field (Gravel / fallen trees)	—	—	3,600 JPY	4,300 JPY	1,200 JPY per hour
❺ Debris / landslide field (Debris)	—	—	3,000 JPY	3,600 JPY	1,000 JPY per hour
❺ Debris / landslide field (Crocks / Sinks)	—	—	3,900 JPY	4,700 JPY	1,300 JPY per hour
❺ Debris / landslide field (Soil slope)	—	—	13,900 JPY	16,700 JPY	4,600 JPY per hour
❺ Debris / landslide field (muddy ground)	—	—	3,700 JPY	4,400 JPY	1,200 JPY per hour
❺ Debris / landslide field (Circuit)	—	—	5,100 JPY	6,200 JPY	1,700 JPY per hour

Period of use

1) The units used are as follows:
【Per month】One month from the beginning of a month to the end of a month
【AM】9:00 – 13:00　【PM】13:00 – 17:00
【Nighttime】17:00 – 21:00　【All day】0:00 – 24:00
【Extratime】0:00 – 9:00 and 21:00 – 24:00

2) It will be added the same amount as the fee if any of the following applies.
①Holding event with collecting admission fee,tuition,membership fee for the purpose of profit
②Using for profit-making such as commodity sales, commercial advertising

3) Fee is reduced to 70%, when using for preparation.
(Preparation : preparation to host a public event)

4) In the case of continued use of more than 2 days, if it is for storage of exhibits or equipment, Nighttime ~ Morning fee will not be collected.

Flow of use

1 Pre-inquiry <by 1 month before the test day>
- Please consult us about how to use any facilities, by E-mail or telephone.
- Please contact us as soon as possible if you want to use any facilities.

2 Check facility availability
- Please check the reservation status on the website.
- After checking the reservation status, please fill out the inquiry form and send it to the reception desk.

3 Test plan meeting
- We will contact you to confirm the contents of use from the person in charge according to the contents of the inquiry.
- If you are asked to submit it, please prepare and send us the documents.

4 Application for use
- If the use is approved after confirming the content, we will send a usage approval and payment form.
- When you receive a reservation contact form from the reception desk, please prepare and send an application form for approval of use.
- If approved, the facility to be used, the date and time will be determined, and the obligation to pay the usage fee will be incurred.

5 Payment of fee
- When you receive a notice of delivery from the receptionist, please pay the usage fee by the due date.
- Payment can only be made by bank transfer or cash over the counter.

6 The test day
- Please use it according to the instructions of the staff, usage manual, etc.
- After use, please restore to its original state and be checked by the staff.

Development base facilities

Facility / Equipment	One month	AM / PM (9:00to13:00・13:00to17:00)	Nighttime (17:00 to 21:00)	Extratime (0:00to9:00,21:00to24:00)
Conference hall	—	14,100 JPY	4,300 JPY perhour	4,600 JPY perhour
Conference hall (including foyer)	—	19,000 JPY	5,700 JPY perhour	6,200 JPY perhour
Conference room 1	—	5,600 JPY	1,700 JPY perhour	1,800 JPY perhour
Conference room 2	—	5,400 JPY	1,700 JPY perhour	1,800 JPY perhour
Conference room 3	—	5,400 JPY	1,700 JPY perhour	1,800 JPY perhour
Room 201 (Laboratory / conference room)	91,300 JPY	5,500 JPY	6,600 JPY	1,800 JPY perhour
Room 202 (Laboratory / conference room)	93,300 JPY	5,500 JPY	6,600 JPY	1,800 JPY perhour
Room 203 (Laboratory / conference room)	94,600 JPY	5,300 JPY	6,400 JPY	1,800 JPY perhour
Room 204 (Laboratory / conference room)	91,400 JPY	5,200 JPY	6,200 JPY	1,700 JPY perhour
Room 101 (Laboratory / development laboratory)	78,700 JPY	4,800 JPY	5,700 JPY	1,600 JPY perhour
Room 102 (Laboratory / development laboratory)	77,900 JPY	4,700 JPY	5,700 JPY	1,600 JPY perhour
Indoor examination place	—	50,300 JPY	60,400 JPY	16,400 JPY perhour
Indoor examination place (when using half space)	—	26,400 JPY	31,700 JPY	8,600 JPY perhour
❷ Test preparation building (Maintenance room)	—	7,000 JPY	8,400 JPY	2,300 JPY perhour
❷ Test preparation building (Preparatory Office 1)	—	5,700 JPY	6,800 JPY	1,900 JPY perhour
❷ Test preparation building (Preparatory Office 2)	—	7,500 JPY	9,000 JPY	2,500 JPY perhour
❸ Outdoor test preparation place	—	4,300 JPY	5,200 JPY	1,400 JPY perhour
❹ Simple measurement room A	—	6,100 JPY	7,300 JPY	2,000 JPY perhour
❺ Simple measurement room B	—	6,900 JPY	8,300 JPY	2,300 JPY perhour

Facility / Equipment	Period of use	Fee
Laboratory 1	One month	109,100 JPY
Laboratory 2	One month	105,700 JPY
Laboratory 3	One month	108,700 JPY
Laboratory 4	One month	108,600 JPY
Laboratory 5	One month	108,700 JPY
Laboratory 6	One month	111,500 JPY
Laboratory 7	One month	105,900 JPY
Laboratory 8	One month	108,600 JPY
Laboratory 9	One month	108,700 JPY
Laboratory 10	One month	110,500 JPY
Laboratory 11	One month	72,500 JPY
Laboratory 12	One month	62,300 JPY
Laboratory 13	One month	62,300 JPY
Laboratory 14	One month	62,300 JPY
Laboratory 15	One month	62,300 JPY
Laboratory 16	One month	74,800 JPY
Depository	All day	9,300 JPY

Facility / Equipment	Period of use	Fee
Depository (when using half space)	All day	5,900 JPY
Rental warehouse 1	One month	59,500 JPY
Rental warehouse 2	One month	59,900 JPY
Rental warehouse 3	One month	58,300 JPY
Rental warehouse 4	One month	59,500 JPY
Rental warehouse 5	One month	59,900 JPY
Rental warehouse 6	One month	58,300 JPY
Rental warehouse 7	One month	21,400 JPY
Rental warehouse 8	One month	21,400 JPY
Rental warehouse 9	One month	21,400 JPY
Rental warehouse 10	One month	21,400 JPY
Rental warehouse 11	One month	21,400 JPY
Rental warehouse 12	One month	21,400 JPY
Rental warehouse 13	One month	21,400 JPY
Rental warehouse 14	One month	21,400 JPY
Shower room	One time	200 JPY

Equipment list

Machining equipment	Fee
Machining center	12,960 JPY per hour
NC milling cutter	2,130 JPY per hour
Semi-automatic lathe	1,110 JPY per hour
Drilling machine	140 JPY per hour
Contour machine	180 JPY per hour
High-speed cut-off machine	420 JPY per hour
Shearing machine	1,850 JPY per hour
Cutting dynamometer	1,510 JPY per hour
Double-headed grinder	110 JPY per hour
Belt grinder	110 JPY per hour
3D printer (1)	920 JPY per hour
3D printer (2)	1,780 JPY per hour
3D printer (1) (FDM type) Molding resin	60 JPY per 10g
3D printer (2) (FDM type) Molding resin	830 JPY per 10g
LMD Metal 3D Printer	11,620 JPY per hour
Metal Powder for LMD Metal 3D Printer (SUS316L)	220 JPY per 10g
Metal Powder for LMD Metal 3D Printer (SKH51)	660 JPY per 10g
Metal Powder for LMD Metal 3D Printer (INCONEL718)	660 JPY per 10g
Precision surface grinding machine	1,120 JPY per hour

Analytical equipment	Fee
Scanning electron microscope	4,460 JPY per hour
Measuring microscope	980 JPY per hour
Fourier transform infrared spectroscopy system	1,190 JPY per hour
Energy dispersive X-ray fluorescence analyzer	1,960 JPY per hour
Stereo microscope	140 JPY per hour
FFT analyzer	770 JPY per hour
Digital microscope	1,950 JPY per hour

Electro mesurement equipment	Fee
Oscilloscope	1,040 JPY per hour
Data logger	200 JPY per hour
Radar evaluation equipment	4,140 JPY per hour
Signal analyzer	3,350 JPY per hour
DC stabilized power supply (18V specification)	130 JPY per hour
DC stabilized power supply (60V specification)	140 JPY per hour
AC stabilized power supply (single-phase specification)	190 JPY per hour
Digital multimeter	260 JPY per hour
Impedance analyzer	850 JPY per hour
Field test system (Handheld microwave analyzer)	3,160 JPY per hour
Network analyzer	2,000 JPY per hour
Arbitrary waveform generator	240 JPY per hour

Other equipment	Fee	Extratime (0:00to9:00,21:00to24:00)
Fume simulatior	100 JPY ※2 ※3	20 JPY per hour
Victim simulatior	400 JPY ※3	90 JPY per hour
Outdoor large monitor system	7,400 JPY ※3	1,840 JPY per hour
Light projector	400 JPY ※2 ※3	90 JPY per hour
Generator	400 JPY ※2 ※3	90 JPY per hour
High-speed camera	4,700 JPY ※3	1,170 JPY per hour

Physical properties equipment	Fee
Vickers hardness tester	530 JPY per hour
Rockwell hardness tester	420 JPY per hour
Universal material testing machine	2,320 JPY per hour

Material processing equipment	Fee
Sputtering device	400 JPY per hour
Sample polishing system	940 JPY per hour

Dimension · shape measurement equipment	Fee
X-ray CT scanner	14,450 JPY per hour
CNC 3-D measuring machine	7,680 JPY per hour
Measuring machine for Surface coarseness and Outline shape	1,070 JPY per hour
Non-contact 3-D digitizer	2,690 JPY per hour
Accuracy evaluation system of machine tool	410 JPY per hour

Environment test equipment	Fee
Pressure test equipment	4,490 JPY per hour
Dust test equipment	3,280 JPY per hour
Constant temperature and humidity chamber	380 JPY per hour
Decompression constant temperature and humidity chamber	2,180 JPY per hour
Thermal shock test machine	770 JPY per hour
Advanced accelerated life test machine	300 JPY per hour
Drying furnace	140 JPY per hour
2-axis switching vibration test machine	4,450 JPY per hour
Single axis vibration test machine	4,310 JPY per hour
Constant temperature and humidity chamber (for combined testing)	1,690 JPY per hour
Waterproof test equipment	2,520 JPY per hour
Rain and spray test equipment	2,780 JPY per hour
Wind resistance test equipment	240 JPY per hour

Anechoic chamber	Fee
Anechoic chamber	9,040 JPY per hour ※1
3-D radiation pattern measurement system	7,270 JPY per hour
TRP/TIS measurement system	8,940 JPY per hour
GNSS receiving system sensitivity evaluation system	2,750 JPY per hour
Multipath phasing evaluation system	5,370 JPY per hour
Radiation EMI measurement system	4,170 JPY per hour
Radiation immunity test system	8,800 JPY per hour

Other equipment	Fee	Extratime (0:00to9:00,21:00to24:00)
Picture record system	5,000 JPY ※3	1,230 JPY per hour
Rental tent	100 JPY ※3	20 JPY per hour
3D motion capture	5,900 JPY ※3	1,480 JPY per hour
Total Station	5,600 JPY	1,400 JPY per hour

※1 Separate fee for each test equipment is added.
※2 Fuel cost (or smoke agent cost) is not included.
※3 Fee will occur in A.M. P.M. and Nighttime.

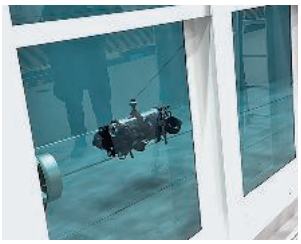
Remarks (1) A.M.: 9:00 a.m. to 1:00 p.m., P.M.: 1:00 p.m. to 5:00 p.m., Nighttime: 5:00 p.m. to 9:00 p.m., All day: 12:00 a.m. to 12:00 a.m., Extratime : 1 hour during 12:00 a.m. to 9:00 a.m. and 9:00 p.m. to 12:00 a.m.
(2) The same amount as fee is added when it falls under any of the following.
1. When holding an event by collecting admission fee, attendance fee, or membership fee for a prot. 2. When using for any prot-making activities, such as selling goods,commercial advertisement, etc.
(3) Fee is reduced to 70%, when using for preparation. (Preparation : preparation to host a public event)
(4) When using continuously for two days or more, fee is not occured from the night to early morning, as far as it is used for storage of display items and equipment.

Underwater and Maritime Robot Facilities - Use Cases -

Case.01 Demonstration Test of a Sea-to-Air Integrated Drone

■Implementation period: December 6 - 8, 2023, January 25 - 26, 2024
■Conducted by: Prodrone Co., Ltd. and others
■Facility used: Submerged urban field, indoor water tank

Sea-to-air integrated drone



ROV testing in the indoor water tank (small water tank)

Flight and water landing tests in the submerged urban field

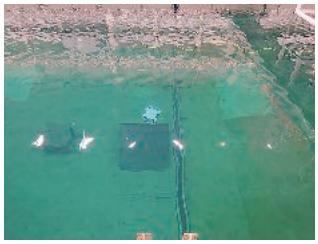
Point!

- The small water tank (5m x 3m with a water depth of 1.7m) is made of glass, allowing for ROV testing while maintaining a direct line of sight
- The submerged urban field allows for a continuous series of drone tests from flight to surface navigation to underwater diving (maximum depth of 5m), all in an outdoor environment

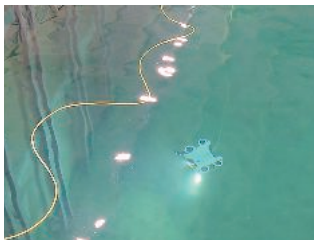
Case.02 ROV Navigation Demonstration Test

■Implementation period: June 6 - 7, 2024
■Conducted by: Suiryu Corporation, Ocean High Technology Institute, Inc.
■Facility used: Indoor water tank (large water tank)

"Ryuzu" ROV with a Doppler Velocity Log



Measuring the structure at the bottom of the indoor water tank (large water tank)



Measuring the wall surface of the indoor water tank (large water tank)

Point!

- The indoor water tank (large water tank) is 30m x 12m with a water depth of 7m
- Planned installation of multiple simulated structures at the bottom and test pieces placed on the walls
- Optional structures can be installed with overhead traveling cranes

Unmanned Aircraft Facilities - Use Cases -

Case.01 Demonstration Flight Test of Hydrogen Fuel Cell Drone

■Implementation period: January 10 - 11, 2023
■Conducted by RoboDEX Inc.
■Facility used: Airfield surrounded by net

"Aigis One," a hydrogen fuel cell-powered logistics drone

Flight test within the airfield surrounded by net

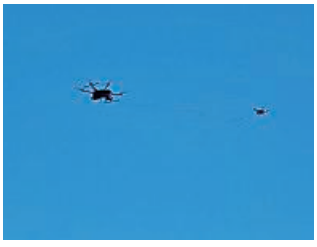
Maintenance of the aircraft

Point!

- The airfield surrounded by net is a vast space of 150m × 80m with an effective height of 15m
- Since the upper surface and the surrounding area are covered with netting, flight tests-including aircraft under development, testing Beyond Visual Line of Sight (BVLOS), and object dropping-can be conducted in the outdoor environment without being subject to restrictions under the Civil Aeronautics Act

Case.02 Demonstration of Anti-Drone Security Systems

■Implementation period: December, 2022
■Conducted by: Toshiba Infrastructure Systems & Solutions Corporation
■Facility used: Minamisoma runway, heliport, etc.



Deployment of a target drone interceptor netting

Images taken from the target drone at the moment of interception

Transport of the intercepted drone to the target site

Point!

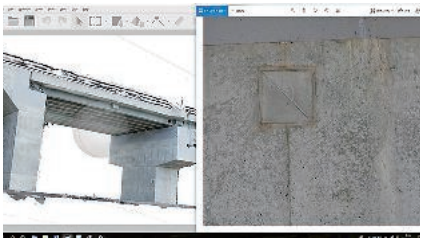
- Large-scale testing over a vast area is possible by using both the runway and the heliport
- The facility has a hangar directly connected to the runway, allowing for not only maintenance and storage of aircraft, but also integrated testing by installing external equipment such as radar systems and antennas

Infrastructure Inspection and Disaster Response Robot Facilities - Use Case (1) -

Case.01 Drone-based Bridge Inspection Service Demonstration Test

■Implementation period: June 15 - 19, 2020
■Conducted by: DENSO CORPORATION
■Facility used: Mockup bridge

Drone flight under test bridge girders



Analysis of measurement data by software

Point!

- The test bridge is 50 m in length, 10 m in road width, and 5 m in girder height
- Four types of steel and concrete structures simulate aging and obstacles
- Realistic bridge inspections can be demonstrated using drones and other technologies

Case.02 Performance Verification of a Mobile High-Speed 3D Tunnel Inspection System

■Implementation period: January 28, 2020
■Conducted by: PACIFIC CONSULTANTS CO., LTD.
■Facility used: Mockup tunnel

A mobile high-speed 3D tunnel inspection system (MIMM-R)

Detection of internal tunnel defects using cameras, radar and lasers

Point!

- The 50-meter-long, circular test tunnel with a 6-meter-wide road
- Installation of test pieces simulating cracks and voids in concrete
- Testing in dark conditions is also possible by closing the shutters on both sides

Infrastructure Inspection and Disaster Response Robot Facilities - Use Case (2) -

Case.01 Firefighting drills based on the Soma Area Wide Area Firefighting Earthquake Countermeasures Plan

■Implementation period: March 10, 2020
■Conducted by: Soma Fire Department Headquarters, Fukushima Prefecture
■Facility used: Urban field

Water discharge training operations using urban field houses

Training at heights using Building A

Point!

- Recreates urban areas with houses, buildings, intersections with traffic lights and signs, and power lines
- Houses and buildings are constructed featuring fully detailed interiors, allowing for a wide range of firefighting drills-from water discharge and rescue training operations to breaching (destruction) of building walls and floors

Case.02 FY 2020 Fukushima Prefecture Comprehensive Disaster Prevention Drills

■Implementation period: November 24, 2020
■Conducted by: Fukushima Prefecture
■Facility used: Debris/landslide field, etc.

Rescue training operations for a vehicle buried in mud and debris

Training using motorcycles to navigate through rubble

Training using amphibious buggies

Point!

- The vast field that recreates road closure sites or landslide sites in a disaster-stricken area
- In addition to testing drones and robots, national and local governments conduct disaster response drills on a regular basis (drone operation training, disaster prevention training, etc.)

Human Resource Development

Robot-Programming Experience

A robot-programming workshop was held for students in Fukushima Prefecture to learn about ICT literacy and AI functions using the Fukushima-developed programming learning robot, "Walking MechatroWeGo."

Special Course
(PNU, Saudi Arabia)

A special course was held for students of Princess Nourah Bint Abdulrahman University (PNU), Kingdom of Saudi Arabia. A demonstration of a hydrogen drone and a mobile hydrogen refueling system were showcased as an experience to learn about advanced energy technology in Japan.

Special Course
(Off-Campus Training for Freshman of the College of Engineering, Nihon University)

A special course was held for freshmen of the Department of Electrical and Electronic Engineering, College of Engineering, Nihon University. In addition to the RTF tour, lectures were given by RTF global advisors, and instructors were invited from RTF resident companies to experience the operation of life-size humanoid robots and underwater drones.

Special Courses (Outreach Program)
(College of Engineering, Nihon University)

Experts in specialized fields held specially tailored outreach programs to meet specific needs.

ROBO-TES FESTA

Drone soccer experience

Every year, we hold "ROBO-TES FESTA," a demonstration and exhibition of robots and drones. The sixth "ROBO-TES FESTA 2025" was held on September 27, 2025. In addition to exhibitor initiatives and product introductions, the event features on-site bus tours of the facility, drone experiences, and an indoor drone show. A total of 32 companies from within and outside Fukushima participated in the exhibition, attracting a total of 1,094 visitors.

Drone demonstration/ROBO-TES bus tour

Commemorative photo with official character "RoTeFie"

Overview of F-REI

WEB SITE

The Fukushima Institute for Research, Education and Innovation (F-REI) is a special corporation established by the Japanese government in April 2023. The institute serves as a world-leading "central institute for creative reconstruction" aiming to realize the recovery of Fukushima and the Tohoku region while strengthening Japan's scientific, technological, and industrial competitiveness.
F-REI conducts R&D to solve local and global challenges in five key research fields leveraging Fukushima's competitive advantage: "Robotics (Robots and Drones) " "Agriculture, forestry and fisheries" "Energy," "Radiation science, medicine and drug development, & industrial applications for radiation" and "Collection and dissemination of data and knowledge on nuclear disasters" We are committed to turn the results of our research into societal impact and implementation, create new industries, and cultivate next-generation talent.
To further advance these initiatives, F-REI integrated the Fukushima Robot Test Field (RTF) in April 2025.
By integrating F-REI's research and development capabilities, primarily centered on robotics, we aim to enhance the growth and utilization of the RTF.

< Provided by the design consortium of NIKKEN SEKKEI LTD, NIHON SEKKEI, INC., and PACIFIC CONSULTANTS CO., LTD. >
*This is a conceptual rendering and the final design may be subject to change

The national government is developing facilities on the west side of JR Namie Station, aiming for a phased start of operations by the end of fiscal 2030.

In October 2025, the RTF hosted the "World Robot Summit (WRS) 2025 Harsh Environment F-REI Challenge," featuring intense competition among research institutes, universities, and companies from Japan and around the world. The event showcased cutting-edge robotics technology aimed at solving challenges in harsh, disaster-stricken environments.

Transport Access

From Tokyo (Approx. 3 hours)

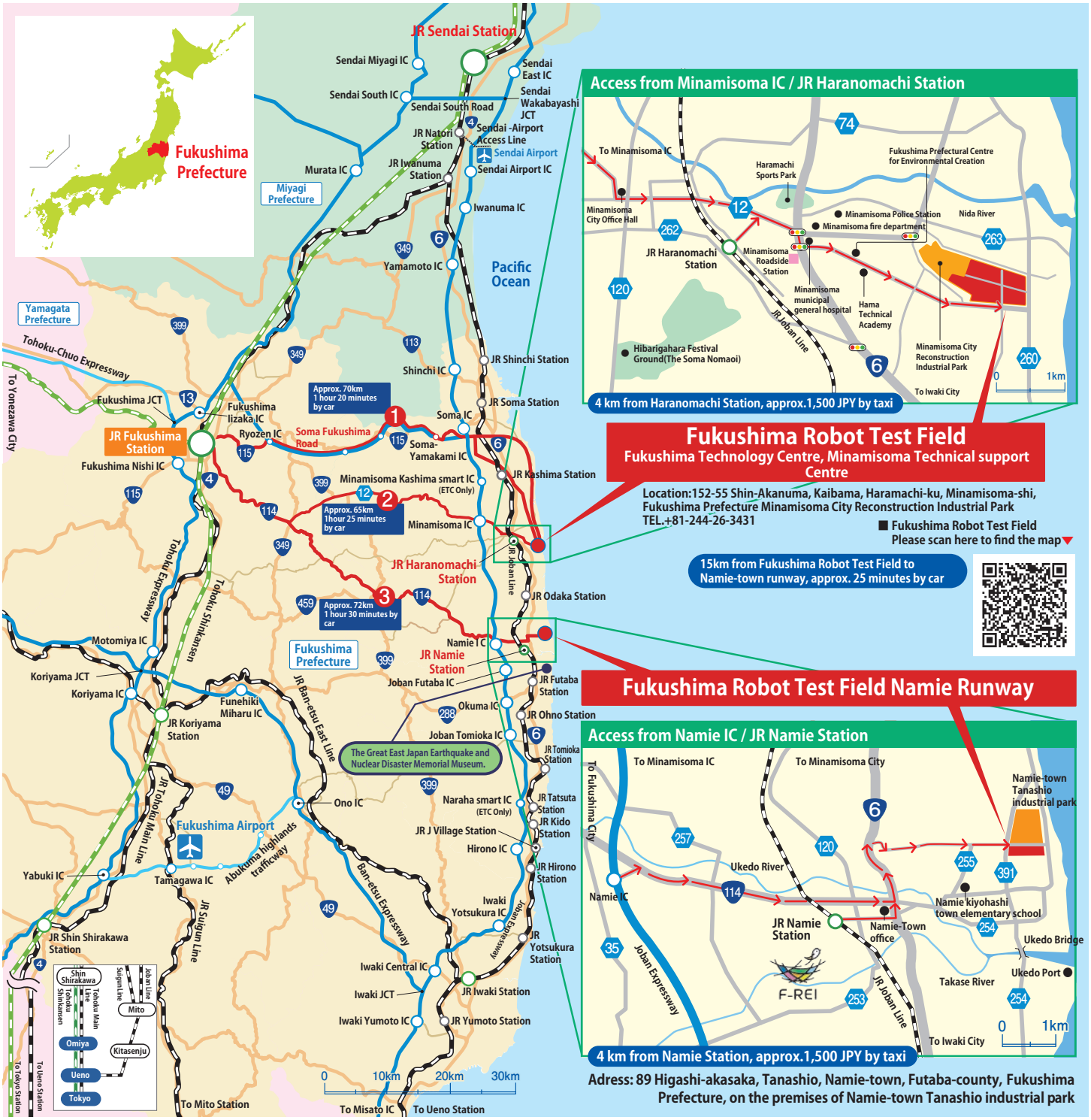
Car	Shinkansen	Train	Bus
Misato IC	JR Tokyo Station	JR Tokyo Station	JR Tokyo Station
Approx. 250km , and 3 hours via Joban Expressway	Approx. 1 hour 30 minutes by Tohoku Shinkansen	Tohoku Shinkansen The fastest approx.1 hour 30 minutes	Approx.3 hours 30 minutes by JR Joban Line Limited Express Hitachi round trip 3 times per a day	The direct bus Tohoku Access takes 1–2times (round trip) per a day (approx. 5 hour)
Minamisoma IC	JR Fukushima Station	JR Sendai Station		
Approx. 9km, 17 minutes via Prefectural Route 12 by car	Direct bus runs roundtrip approx. 1 hour 45 minutes 12 times per a day	JR Joban Line runs per an hour approx. 1hour 20 minutes		
Fukushima Robot Test Field	JR Haranomachi Station	JR Haranomachi Station	JR Haranomachi Station	JR Haranomachi Station

From Fukushima City (Approx. 90 min.)

Car	Bus
JR Fukushima Station	JR Fukushima Station
❶Approx. 1 hour 20 minutes , 70km via National Route 115・Soma Fukushima road ❷Approx.1 hour 25 minutes, 65km via National Route 114 and Prefectural Route 12	The direct bus Fukushima Traffic・Tohoku Access takes 12 times(roundtrip) per a day (approx.1 hour 45 minutes)
	JR Haranomachi Station
	The direct bus Tohoku Access takes 3times(roundtrip) per a day(approx.10minutes)
Fukushima Robot Test Field	Fukushima Robot Test Field

From Sendai Airport (Approx. 70 min.)

Car	Train
Sendai Airport IC	Sendai Airport Station
Approx. 55 km , 50 minutes via Sendai Eastern Road and Joban Expressway	Train runs approx. 10 minutes and 2-3 times per hour (Sendai Airport Line)
Minamisoma IC	JR Natori Station
Approx. 17 minutes , 9km via Prefectural Route 12	Train runs aprrox.1 hour 10 minutes per hour (JR Joban Line)
Fukushima Robot Test Field	JR Haranomachi Station



April, 2026