

Telescope Utility Service (TUS) of Thirty Meter Telescope (TMT)

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TMT-J Project/NAOJ

What's TUS?

TUS: Telescope Utility Service

What's Utility Service?

- Electricity
- Gas
- Water
- Telecommunication

- And etc.



Service provided by TUS

- ◆ Electrical Power and Ground
- ◆ Network: Communication and Information System
- ◆ Chilled Water
- ◆ Oil for Hydrostatic Bearing System
- ◆ Compressed Air
- ◆ LN2 for Cryogen
- ◆ CO2 for Refrigerant
- ◆ Lighting
- ◆ Fire Alarm



Let me tell you in advance...

No technical information

Difficulty of International Collaborating Complexity of TUS

International Collaborating



TUS Design
Contractor

Tucson, AZ

TUS-3
Installation
Contractor



Structures
Group

Facilities
Group

Systems
Engineering
Group



Subsystem Groups

TMT International Observatory

Pasadena, CA



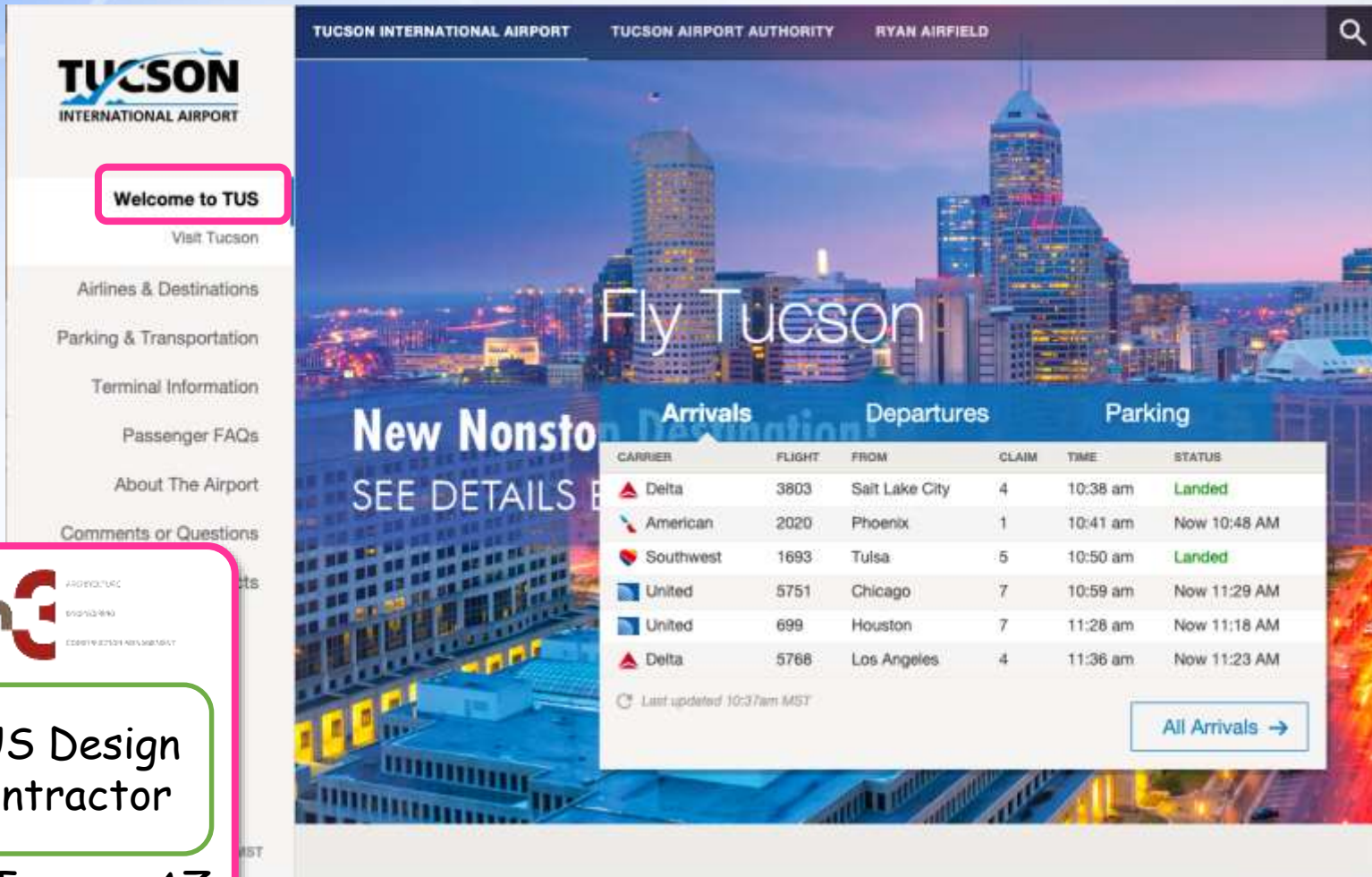
Mitaka, Tokyo



Telescope
Structure
Contractor



Amagasaki, Osaka



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Arrivals			Departures		Parking
CARRIER	FLIGHT	FROM	CLAIM	TIME	STATUS
Delta	3803	Salt Lake City	4	10:38 am	Landed
American	2020	Phoenix	1	10:41 am	Now 10:48 AM
Southwest	1693	Tulsa	5	10:50 am	Landed
United	5751	Chicago	7	10:59 am	Now 11:29 AM
United	699	Houston	7	11:28 am	Now 11:18 AM
Delta	5768	Los Angeles	4	11:36 am	Now 11:23 AM

Last updated 10:37am MST

[All Arrivals →](#)



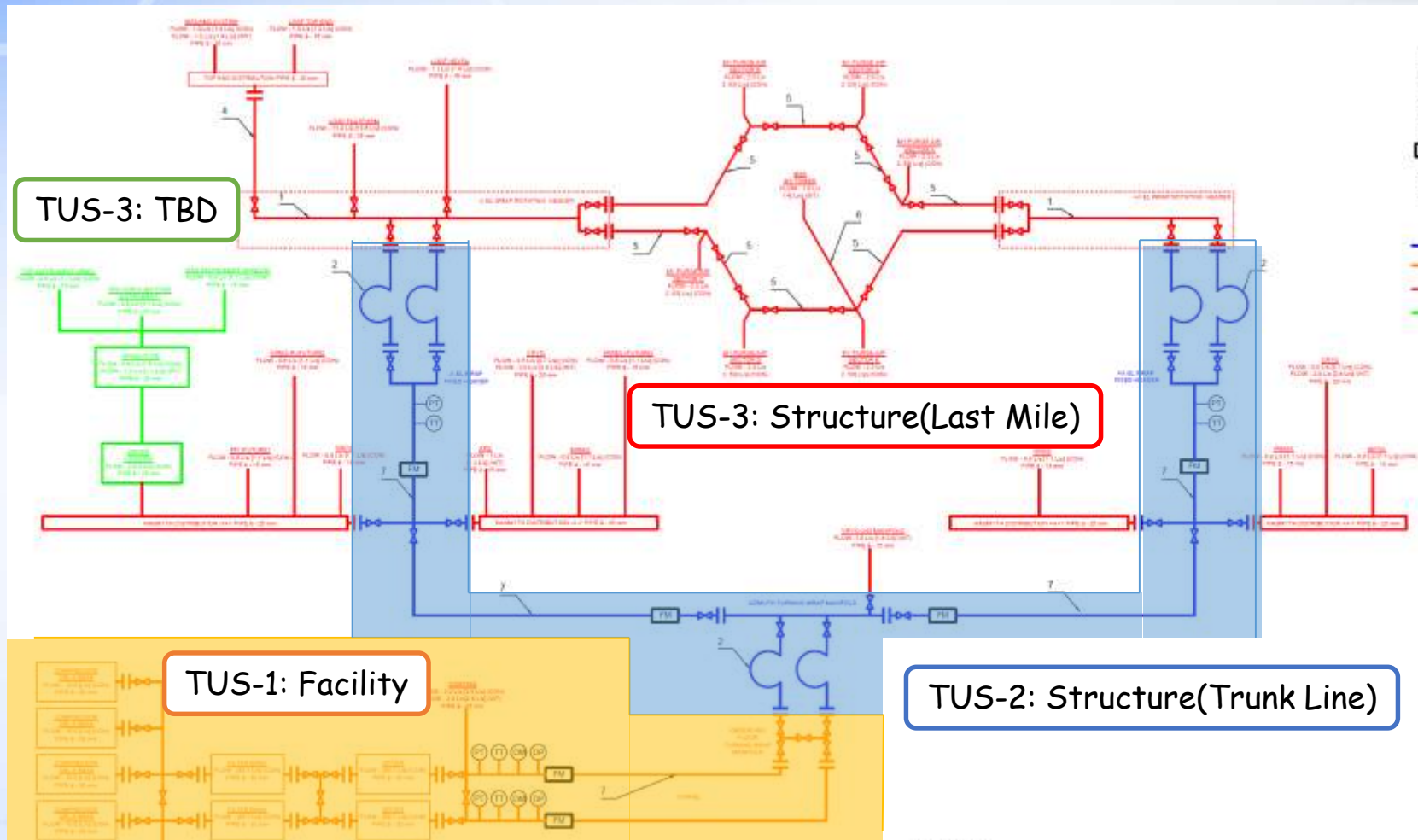
**TUS Design
Contractor**

Tucson, AZ

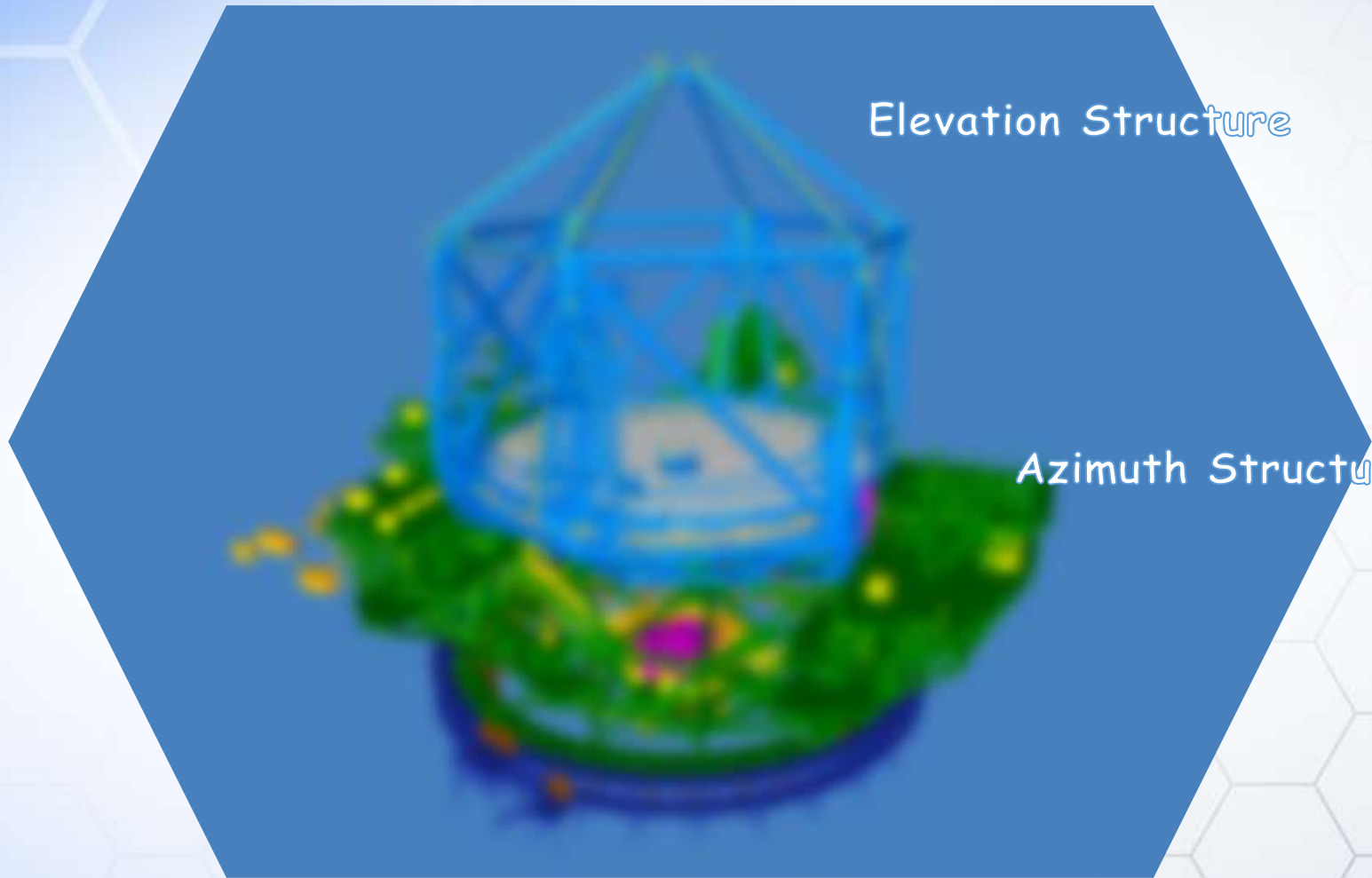
Example: Division responsibilities

Description	TMT Systems Engineering Group	TMT Facilities Group	TMT Structures Group	M3 Engineering	MELCO	TUS-3 Installation Contractor	Other TMT Group with Equipment on Telescope
1 Develop TUS design requirements	<p>Develop top level requirements (for vibration, heat dissipation, etc.).</p> <p>Review TUS Design Requirements Document (DRD).</p> <p>Incorporate DRD into DOORS.</p>	<p>Provide input for, review and comment on top level design requirements and TUS DRD.</p>	<p>Work with Systems Engineering Group, Controls Group and Facilities Group to develop the TUS DRD.</p> <p>Update DRD based on feedback from M3 Engineering and MELCO.</p>	<p>Research US national and Hawaii standards, and recommend the standards to be followed by TMT; this includes preparing the TMT Telescope Electrical Design Guide document.</p> <p>Review the TUS DRD and submit recommendations for revisions.</p>	<p>Review the TUS DRD, the TMT Telescope Electrical Design Guide and relevant sections of the STR DRD, and submit comments and recommendations</p>	N/A	<p>Controls Group will contribute to and review the TUS DRD, and submit recommendations for revisions.</p> <p>All groups will develop interface documents with the Structure, including information about the utility services required.</p>
	<p>Define top-level requirements for electrical power, including extra capacity margin required at first light.</p>	<p>Contract with M3 Engineering to design the source equipment in the Summit Facilities Building.</p> <p>Provide source equipment in Utility Room.</p> <p>Provide cabling from power panels to the junction boxes at the end of the tunnel, near</p>	<p>Work with other TMT groups on ICD requirements for power panels.</p> <p>Contract with M3 Engineering to develop the TMT Telescope Electrical Design Guide.</p>	<p>Research US national and Hawaii standards, and prepare the TMT Telescope Electrical Design Guide document.</p> <p>Develop preliminary design of electrical</p>	<p>Submit information to TMT about required electrical power for STR equipment.</p> <p>Prepare detailed design of electrical distribution system for second part of TUS and iterate the design</p>	<p>Provide and test the third part of the electrical distribution system, including providing the distribution panels for circuits leading to non-STR telescope-mounted</p>	<p>Submit information to Systems Engineering about required amount of electrical power. Include information in ICD about location of utility service panels for the subsystem.</p>

Example: Facility Compressed Air



Complexity of TUS



Elevation Structure

Azimuth Structure

Foundation

Various Barriers

- ◆ Language
 - English and Japanese
- ◆ Time zone
 - PST(Pasadena), MST/PDT(Tucson/Pasadena), and JST
- ◆ Physical distance
- ◆ Limited budget
- ◆ Different development speed
- ◆ Different development philosophy



Every day, I am looking for ways
to overcome these barriers



Thank you very much
for your attention