

Use of the Mission Dependency Index in Construction Project Identification

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NASA decided to employ the Mission Dependency Index (MDI) in 2004, a measure of the relative importance of a facility and the difficulty in replacing its functional capacity in the view of the manager of the activity associated with the facility, as a means of supporting:

1. Efficient mission-based execution of institutional facilities management
2. Project prioritization decision-making for Construction of Facilities
3. Physical vulnerability assessments
4. Potential divestiture target identification

The MDI scale is built upon responses to two fundamental questions:

1. How long can a facility be out of service before the user’s ability to perform its mission is adversely impacted?
2. How difficult or costly is it to relocate the services or replace or repair this facility should it become unusable?

MDI Scores and Descriptive Scales

MDI Scores Mapped to Risk Severity and Federal Real Property Council Mission Criticality Rating		
Mission Dependency Index Score	Risk Severity Descriptive Term	Federal Real Property Council Mission Criticality Rating
86 - 100	Critical	Mission Critical
71 - 85	Significant	
55 - 70	Relevant	Mission Dependent
10 - 54	Moderate	
0 - 9	Low	Not Mission Dependent

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Mission Dependency Index
Application and Maintenance

In 2010, the NASA adopted a standard approach to monitoring facility utilization and MDI within the IEMP Real Property Module based upon the NASA Work Breakdown Structure (WBS). The advantage of this approach is that it is possible to map facilities to the specific programs which they support.

Integrating MDI and Deferred Maintenance

Applying DM, MDI and CRV values in combination as a screen to identify facilities which are very importance to the NASA mission, are costly to replace and are below some threshold condition level is a logical approach. The Deferred Maintenance Limits Study Phase II (NASW-02010 Task Order 006) report recommended Facilities Condition Index (FCI) and Deferred Maintenance (DM) goals for each of 9 systems within 41 facility categories as shown in the example below for the facility category: R&D and Test Buildings.

R&D and Test Buildings	CRV (\$M): ^{27%} \$6,123 of NASA CRV
System	Condition Target
	Rating
Structure	4
Roof	4
Exterior	4
Interior Finishes	4
Electrical	5
HVAC	5
Plumbing	4
Conveyances	5
Pgm Support Equip	5
FCI =	4.4
FY03 FCI =	3.8

Applying these FCI goals to each asset within the Real Property Inventory under the assumption that all assets were equally important generated an overall FCI goal of 4.3. MDI provides a basis for adjusting the goal condition for each facility by its relative contribution to missions. As indicated in Figure 6, the Risk Severity scale places facilities with an MDI score of 86 – 100 in the CRITICAL category, and those with a score of 71 – 85 in the SIGNIFICANT category. These scores were constructed from the perspective of NASA program and project users of NASA facilities. Table 1 shows this concept using recommended condition limits which are explained below.

Table 1. Recommended FCI for Facilities by Facility Category^a

DM Cat	NASA Facility Description Category	FY03 FCI ^a	Goal FCI ^b	Minimum FCI for MDI (86-100) CRITICAL ^c Facilities	Minimum FCI for MDI (71-85) SIGNIFICANT ^d Facilities
15	Lighting	2.9	4.8	4.5	4.3
16.2	Electric Substations, Switchgear & Transformer Yards	3.8	4.8	4.5	4.3
20	Launch Pads	4.0	4.8	4.5	4.3
3	Wind Tunnels	3.8	4.6	4.3	4.1
4	Engine/Vehicle Static Test Facilities	3.4	4.6	4.3	4.1
13.1	Large Antennas	4.2	4.6	4.3	4.1
16	Electrical Distribution System	3.4	4.6	4.3	4.1
14	Mission Control Operations Buildings	4.0	4.5	4.2	4.0
20.2	Launch propellant & high pressure gas facilities	3.5	4.5	4.2	4.0
23.1	Operational maintenance facilities	3.2	4.5	4.2	4.0
27.1	Compressed Air Generation	3.5	4.5	4.2	4.0
5	Administrative Buildings	3.8	4.4	4.1	3.9
10.2	Fueling Stations & Systems	4.0	4.4	4.1	3.9
16.1	Power Generation/Power Plant	3.8	4.4	4.1	3.9
2	R&D Structures and Facilities	3.4	4.4	4.1	3.9
1	R&D and Test Buildings	3.8	4.4	4.1	3.9
6	Training Buildings	3.4	4.3	4.0	3.8
10.1	Specialized Liquid Storage Tanks	4.6	4.3	4.0	3.8
12	Communication and Tracking Buildings	3.8	4.3	4.0	3.8
13	Communication and Tracking Facilities	3.9	4.3	4.0	3.8
17	HVAC Distribution	3.7	4.3	4.0	3.8
10	Fuel Storage Tanks	3.9	4.2	3.9	3.7
13.2	Small Antennas	4.2	4.2	3.9	3.7
18.1	Waste Water Facilities & Treatment Plants	4.0	4.2	3.9	3.7
17.1	HVAC Generation	3.7	4.1	3.8	3.6
18	Waste Water Collection & Disposal System	3.6	4.1	3.8	3.6
22	Rail	3.0	4.1	3.8	3.6
7	Trailers	3.5	4.0	3.7	3.5
8	Storage Buildings	3.8	4.0	3.7	3.5
9	Storage Facilities	4.0	4.0	3.7	3.5
11	Magazines	4.0	4.0	3.7	3.5
19	Potable Water Distribution System	3.6	4.0	3.7	3.5
19.1	Potable Water Facilities & Treatment Plants	3.8	4.0	3.7	3.5
20.1	Launch support camera pads	4.1	4.0	3.7	3.5
21	Pavement	3.5	4.0	3.7	3.5
23	Maintenance Facilities and PW Shops	3.3	4.0	3.7	3.5
24	Other Buildings	3.0	4.0	3.7	3.5
27	Compressed Air Distribution	2.0	4.0	3.7	3.5
28	Prefabricated buildings, various uses	4.1	4.0	3.7	3.5
29	Berthing & Housing	3.7	4.0	3.7	3.5
25	Other Facilities	3.9	3.9	3.6	3.4
18.2	Storm Drains, Ditches, Dams, Retaining walls	3.2	3.8	3.5	3.3
NASA Averages		3.6	4.3		4.0

Notes to Table 1

^aThe FY03 FCI is used because this is the database used for the Deferred Maintenance Limits Study – Phase II Report- June 30, 2004, page 28.

^bGoal FCI” – This method of analysis does not attempt to establish a date for attaining the goal. The date the goal would be attained depends upon the amount of funding available.

^c2007 Deferred Maintenance Report computed the standard deviation of FCI values at 0.3. For the purpose of establishing an “FCI for CRITICAL (MDI 81-99) Facilities” the standard deviation value of 0.3 has been subtracted from the Goal FCI.

^dFor the purpose of establishing an “FCI for SIGNIFICANT (MDI 61- 80) Facilities” the standard deviation value of 0.5 (1.5 Sigma) has been subtracted from the Goal FCI.

Table 2. Deferred Maintenance Categories and System CRV Percentages

DM Cat	NASA_BLDG	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP	SUM
1	R&D and Test Buildings	0.18	0.19	0.04	0.15	0.20	0.04	0.01	0.15	0.04	1.00
2	R&D Structures and Facilities	0.40	0.17	0.01	0.06	0.25	0.02	0.02	0.03	0.04	1.00
3	Wind Tunnels	0.30	0.05	0.01	0.01	0.15	0.01	0.01	0.01	0.45	1.00
4	Engine/Vehicle Static Test Facilities	0.38	0.03	0.01	0.04	0.26	0.01	0.03	0.02	0.22	1.00
5	Administrative Buildings	0.19	0.17	0.06	0.16	0.18	0.05	0.03	0.16	0.00	1.00
6	Training Buildings	0.18	0.20	0.05	0.12	0.21	0.05	0.01	0.18	0.00	1.00
7	Trailers	0.20	0.19	0.06	0.18	0.20	0.02	0.00	0.15	0.00	1.00
8	Storage Buildings	0.60	0.15	0.10	0.04	0.06	0.01	0.00	0.04	0.00	1.00
9	Storage Facilities	0.55	0.22	0.11	0.03	0.04	0.01	0.00	0.04	0.00	1.00
10	Fuel Storage Tanks	0.70	0.13	0.02	0.00	0.10	0.05	0.00	0.00	0.00	1.00
10.1	Specialized Liquid Storage Tanks	0.51	0.13	0.02	0.00	0.14	0.20	0.00	0.00	0.00	1.00
10.2	Fueling Stations & Systems	0.40	0.10	0.05	0.05	0.15	0.20	0.00	0.05	0.00	1.00
11	Magazines	0.33	0.30	0.05	0.06	0.15	0.02	0.00	0.09	0.00	1.00
12	Comm. & Tracking Buildings	0.21	0.20	0.05	0.16	0.18	0.05	0.00	0.15	0.00	1.00
13	Comm. & Tracking Facilities	0.55	0.10	0.02	0.05	0.26	0.00	0.00	0.02	0.00	1.00
13.1	Large Antennas	0.20	0.20	0.02	0.05	0.15	0.02	0.01	0.02	0.33	1.00
13.2	Small Antennas	0.50	0.30	0.00	0.00	0.10	0.00	0.00	0.00	0.10	1.00
14	Mission Control Operations Buildings	0.22	0.13	0.05	0.15	0.20	0.04	0.02	0.10	0.09	1.00
15	Lighting	0.17	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	1.00
16	Electrical Distribution System	0.39	0.03	0.00	0.00	0.58	0.00	0.00	0.00	0.00	1.00
16.1	Power Generation/Power Plant	0.30	0.10	0.05	0.10	0.39	0.01	0.00	0.05	0.00	1.00
16.2	Electric Substations, Switchgear & Transfer Yards	0.10	0.07	0.00	0.00	0.83	0.00	0.00	0.00	0.00	1.00
17	HVAC Distribution	0.30	0.10	0.00	0.00	0.33	0.27	0.00	0.00	0.00	1.00
17.1	HVAC Generation	0.20	0.10	0.05	0.35	0.10	0.15	0.00	0.05	0.00	1.00
18	Waste Water Collection & Disposal System	0.50	0.02	0.02	0.00	0.05	0.41	0.00	0.00	0.00	1.00
18.1	Waste Water Facilities & Treatment Plants	0.34	0.10	0.05	0.03	0.15	0.32	0.00	0.01	0.00	1.00
18.2	Storm drains, Ditches, Dams, Retaining walls	0.90	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	1.00
19	Potable Water Distribution System	0.38	0.05	0.02	0.00	0.05	0.50	0.00	0.00	0.00	1.00
19.1	Potable Water Facilities & Treatment Plants	0.25	0.05	0.05	0.03	0.24	0.37	0.00	0.01	0.00	1.00
20	Launch Pads	0.51	0.10	0.03	0.03	0.25	0.04	0.02	0.02	0.00	1.00
20.1	Launch support camera pads	0.80	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.00	1.00
20.2	Launch propellant & high pressure gas facilities	0.48	0.05	0.02	0.00	0.20	0.25	0.00	0.00	0.00	1.00
21	Pavement	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
22	Rail	0.95	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	1.00
23	Maintenance Facilities & PW Shops	0.20	0.14	0.06	0.13	0.30	0.09	0.00	0.08	0.00	1.00
23.1	Operational maintenance. Facilities	0.20	0.14	0.06	0.13	0.28	0.09	0.02	0.08	0.00	1.00
24	Other Buildings	0.22	0.15	0.12	0.10	0.15	0.11	0.00	0.15	0.00	1.00
25	Other Facilities	0.71	0.10	0.02	0.05	0.10	0.01	0.00	0.01	0.00	1.00
26	Land & Easements	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
27	Compressed Air Distribution	0.50	0.00	0.00	0.00	0.10	0.40	0.00	0.00	0.00	1.00
27.1	Compressed Air Generation	0.25	0.10	0.05	0.05	0.15	0.35	0.00	0.05	0.00	1.00
28	Prefab buildings, various uses	0.18	0.17	0.05	0.15	0.15	0.15	0.00	0.15	0.00	1.00
29	Berthing & Housing	0.15	0.17	0.09	0.16	0.18	0.07	0.02	0.16	0.00	1.00

