Indo-German Environment Partnership

igep

Greening of GIP Jadcherla, Telangana

March, 2015

Prepared by

german cooperation
DEUTSCHE ZUSAMMENARBEIT

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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About GIZ

GIZ has been implementing Indo-German co-operation for over 60 years. It supports change processes for sustainable development, mutually agreed by the two Governments and other funding partners. GIZ uses a bouquet of customised, innovative solutions, backed by tested German methods. GIZ India has staff strength of over 300 people, and handles an annual business volume of about € 50 million (INR 400 crores).

India belongs to the G20 and BRICS, and is fast emerging as an industrial and nuclear power. Despite the country's rapidly growing economy; poverty and social issues remain a challenge. The burgeoning population and accelerated urbanisation in the country has resulted in an environment that is at risk, and greenhouse gas emissions that continue to spiral upwards. India aspires for sustainable and inclusive growth.

GIZ India is studying how it can participate in new initiatives of the Government of India, e.g. Rejuvenation of Ganga, Clean India, Skill Development, or Agricultural Innovation. GIZ currently works in areas where needs and strengths of India and Germany are in alignment.

- Energy efficiency and renewable energies: introduce German technologies and reform institutional set ups
  - mitigation of greenhouse gas emission
  - more efficient power generation and industrial production
  - propagation of new business models for solar energy and improved cook stoves
  - green energy corridors for power distribution
- Environment:
  - support green cities and industries
  - strengthen resilience to climate change
  - enhance productivity in agriculture
  - protect green spaces and biological diversity
  - support sustainable forests
  - introduce economic incentives for a green economy
- Sustainable economic development:
  - access to rural finance
  - social security and insurance for the poor
  - small and medium enterprises
  - responsible business management
  - vocational training and skill development based on the German model

Our funding partners are the German Federal Ministry for Economic Cooperation and Development (BMZ), the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), and Indian public sector clients, multilateral organisations (e.g. EU), Foundations, and Non-governmental organisations.

About IGEP

The Indo-German Environment Partnership (IGEP) Programme focuses on pilot measures and policy decisions of national level relevance for the enhancement of resource efficiency, reduction of environmental stress, improved service delivery in urban infrastructure services and mitigation of greenhouse gas emissions. The programme aims at responding to some key challenges identified in the policy framework of the Ministry of Environment and Forests, Government of India. The overall objective of IGEP is that the decision makers at national, state and local level use innovative solutions for the improvement of urban and industrial environmental management and for the development of an environment and climate policy that targets inclusive economic growth de-coupled from resource consumption.

Foreword

Dr. Dieter Mutz
Director
Indo German Environment Partnership (IGEP) Programme
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
New Delhi

The industry sector plays a very important role in Telangana state's economy. Telangana has more than 120 Industrial parks, in varied sizes, with Hyderabad being hub of the industrial and business activity. The State has several existing industrial parks housing thousands of industries. These industrial parks, particularly the very old ones, need improvements with cost effective infrastructure to support the industries housed in the industrial parks as well as to deal with negative environmental impacts. The existing industrial parks as well as the new Industrial Parks and Investment Zones have great potential for technological progress.

The main difference between a 'Green industrial park' and a conventional industrial area can be understood in terms of a sustainable layout design, facilities for companies and employees, environmental and technological infrastructures and integrated site management. The Site Master Plan is not just a layout plan but has much greater complexity and value. It is a comprehensive document that sets out an overall strategy for development of the industrial estate including various thematic layers, standards and management concepts for operation of Industrial Park.

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH has prepared this report on 'Greening of GIP Jadcherla', which is an in-depth study of partially developed GIP Jadcherla and strategy to make it 'Green; through replanning and provision of necessary infrastructure. This report also has a section on standards, benchmarks and rating systems internationally followed for 'Green Industrial Parks'. Various thematic maps have been included for showcasing the pragmatic zoning, optimal land use, hierarchical circulation pattern, environmental infrastructure, technical infrastructure as well as social infrastructure.

A team of national and international experts with several years of standing experience in applied research and collaboration services were brought together for this task. We are sure, with the industrial corporation taking forward the initiative of environment friendly site master planning and development; the cumulative results will go a long way in sustainable development of the state and the whole nation.

New Delhi
March, 2015

(Dr. Dieter Mutz)
Director, GIZ (IGEP)

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Chapter 01
About GIP Jadcherla

A. About the Site

The site is located approximately 83 km from the city of Hyderabad in the South Indian state of Telangana. The total area of the site is 3.86 km^2 (954.23 acres) with certain areas already under development. The development of the Green Industrial Park (GIP) at Jadcherla had commenced in 2007. The allotment of plots and road construction was already undertaken partially. The GIP Jadcherla is located at survey nos. 408 to 412, 418 to 435, 437 to 445, 452 to 459 of Polepally Village, Jadcherla Mandal, and survey nos. 588 to 630 of Rajapur Village, Balanager Mandal of Mahboobnagar District. (Refer image no. 1-1).

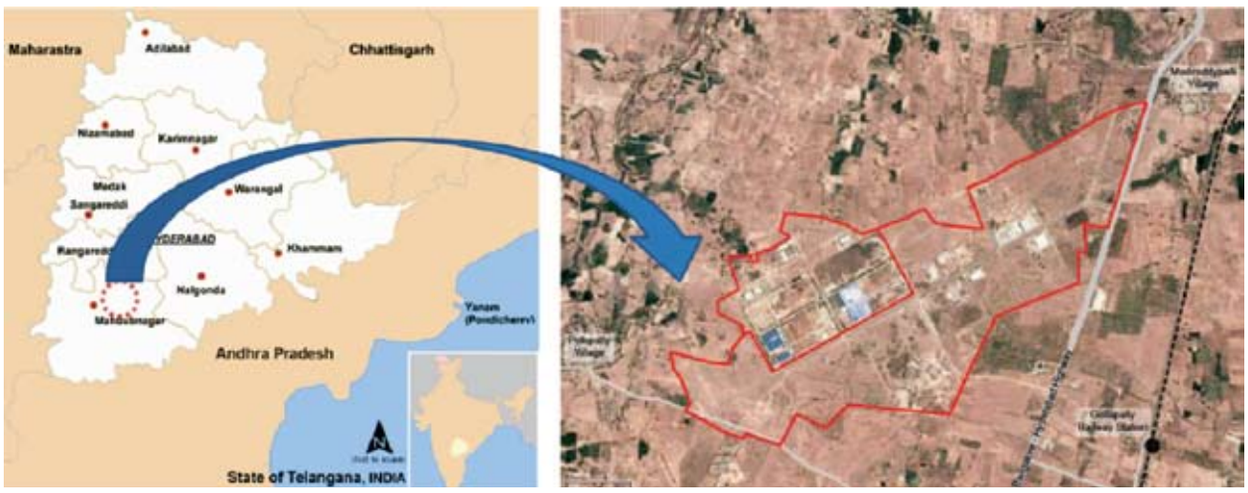


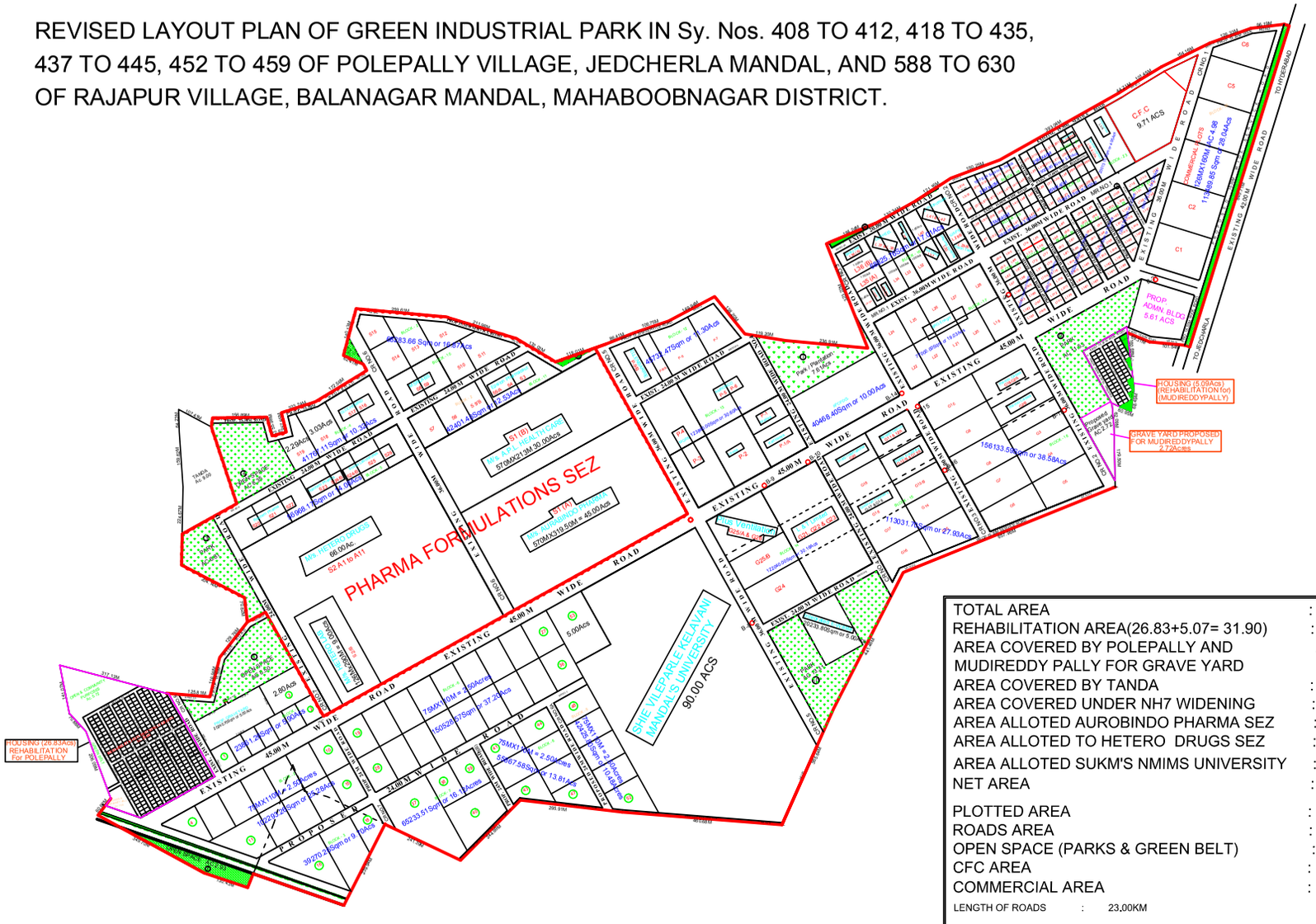
Image no. 1-1: Location of site in Telangana

[Left image: Districts Map of Telangana State (June 2014). In Wikipedia. Retrieved from http://en.wikipedia.org/wiki/Mahbubnagar_district#mediaviewer/File:Telangana_Districts_Map.png, Right image : © Happold Cities]

B. About the Existing Site Master Plan

A preliminary Site Master Plan of GIP Jadcherla (refer map no.1-1) was prepared by Andhra Pradesh Industrial Infrastructure Corporation ltd (erstwhile developer of the GIP) taking into consideration the requirements and standards of the Directorate of Country Planning (DTCP), of the Government of Andhra Pradesh. Within GIP Jadcherla, approximately 0.97 km^2 (240 acres) of land was notified as special economic zone while rest of the area was planned for industrial plots, parks and open spaces, roads, commercial zone, rehabilitation zone and common facility centre. The rehabilitation zone was planned by APIIC for 415 plots. (Refer table no. 1-1).

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN Sy. Nos. 408 TO 412, 418 TO 435, 437 TO 445, 452 TO 459 OF POLEPALLY VILLAGE, JEDCHERLA MANDAL, AND 588 TO 630 OF RAJAPUR VILLAGE, BALANAGAR MANDAL, MAHABOOBNAGAR DISTRICT.



TOTAL AREA	:	954.23 Acs
REHABILITATION AREA(26.83+5.07= 31.90)	:	- 31.90 Acs
AREA COVERED BY POLEPALLY AND MUDIREDDY PALLY FOR GRAVE YARD	:	- 7.72 Acs
AREA COVERED BY TANDA	:	- 9.00 Acs
AREA COVERED UNDER NH7 WIDENING	:	- 6.03 Acs
AREA ALLOTED AUROBINDO PHARMA SEZ	:	- 75.00 Acs
AREA ALLOTED TO HETERO DRUGS SEZ	:	- 75.00 Acs
AREA ALLOTED SUKM'S NMIMS UNIVERSITY	:	- 90.00 Acs
NET AREA	:	659.58 Acres
PLOTTED AREA	:	445.56 Acs (67.56%)
ROADS AREA	:	144.25 Acs (21.87%)
OPEN SPACE (PARKS & GREEN BELT)	:	60.11 Acs (09.11%)
CFC AREA	:	9.71 Acs (1.47%)
COMMERCIAL AREA	:	28.04 Acs (4.25%)
LENGTH OF ROADS	:	23.00KM

Note: ACS means Acres, CFC means Common facility centre, NH7 means National Highway 7

Map no. 1-1: GIP Jadcherla- Previous Master Plan

[Source: APIIC]

Table no. 1-1: GIP Jadcherla: Overview

S. No.	Description	Area (km^2)	Area (acre)
1	**Total area**	**3.86**	**954.23**
	Rehabilitation area -	0.12	31.90
	Area for grave yard	0.03	7.72
	Area covered by Tanda[1]	0.04	9.00
	Area covered under NH-7 widening	0.02	6.03
	Area allotted to Aurobindo Pharma SEZ	0.30	75.00
	Area allotted to Hetero Drugs SEZ	0.30	75.00
	Area allotted to University	0.36	90.00
2	**NET AREA**	**2.67**	**659.58**
	Plotted area	1.80	445.56
	Roads area	0.58	144.25
	Open space (parks & green belt)	0.24	60.11
	CFC area	0.03	9.71
	Commercial area	0.11	28.04

Source: APIIC

C. Process Followed for Greening of GIP Jadcherla

A scientific as well as a participatory process was followed for 'Greening' the Site Master Plan. The process started with a training workshop with the APIIC team, conducted by GIZ's international consultants including the German Sustainable Building Council (DGNB) and BuroHappold Engineering, Berlin. The training workshop lead to the identification of some of the potentials for 'Greening' of the GIZ Site Master Plan, as put forward by the participants from APIIC as well as by the consultants.

In addition to these identified potentials and suggestions, the GIZ-IGEP team further reviewed the standards, rating systems, guidelines, and bench marks for industrial parks within India as well as those from outside the country. Accordingly, the GIZ-IGEP developed concepts for a revision of the preliminary Site Master Plan and discussed it with APIIC officials through an elaborate workshop to finalize the conceptual plans for the 'Greening' of GIP Jadcherla in February 2014.

The next step was to develop to-scale-drawings incorporating the identified 'Green' aspects. This required derivation of norms and design concepts to assess land requirements and appropriate placement within the Site Master Plan. The drawing scale and components of the Site Master Plan were fixed as required by the URDPFI[2] and Andhra Pradesh Building Rules 2012[3]. Layers were generated on the Site Master Plan in AutoCAD and a draft Site Master Plan was developed. This was subjected to further scrutiny by APIIC teams to finalize the revised Site Master Plan for GIP Jadcherla.

1 *Tanda* is a Telugu word which means a caravan, horde, troop, encampment or a collection of men or things. In context of GIP Jadcherla, it stands for a settlement of people

2 Ministry of Urban Development, Government of India. (2015). *Urban and Regional Development Plans Formulation and Implementation Guidelines.* New Delhi, India.

3 Andhra Pradesh Building Rules. Retrieved from http://dtcp.ap.gov.in:9090/webdtcp/G.O.Ms.No.168,Dt.07-4-2012-AP%20Building%20Rules.pdf

The process followed for 'Greening of GIP Jadcherla' is illustrated below:

Oct 2013	• Training Workshop
Jan 2014	• Recommendations by GIZ Consultants (BuroHappold Engineering and DGNB)
Apr 2014	• Compilation of standards, rating systems, guidelines and bench marks, for greening/master planning
Feb 2014	• Conceptual plan preparation (APIIC-GIZ workshop)
Mar 2014	• Derivation of norms and design concepts
Mar 2014	• Consultation with APIIC teams
Mar 2014	• Revised master plan
July 2014	• Meetings were held with the working group to further refine the plan
Aug 2014	• A framework for calculating cost of construction given to the working group
Aug 2014	• Submission of revised master plan to TSIIC for further cost estimations
Sept 2014	• Submission of revised master plan to DGNB for evaluation and rating
Oct 2014	• DGNB's review of master plan for compliance with 'Green Industrial park' standards
Jan 2015	• Finalisation of Site Master plan

Details of the process are given below:

Training-Workshop of APIIC Officials

Under the IGEP[4] Programme, GIZ organized three training programmes on 'Planning of New Green Industrial Parks and Investment Zones' during October 1-11, 2013 in Hyderabad. The training programmes[5] were conducted by Head of Cities-Central Europe, BuroHappold Engineering, GmbH. The three training programmes included an orientation programme for APIIC officials on day 1, a training programme for consultants on day 2, and a training programme for Government officials on day 3 which focused on:

- Planning systems and procedures;
- Green rating systems;
- Suggestions for incorporation of green aspects in the new industrial parks; and
- Case studies.

Details are given below.

An Orientation Programme for APIIC Officials

A one- day orientation programme was conducted on October 1, 2013, in Hyderabad. About 16 participants from APIIC took part in the orientation programme, which focused on re-planning of Site Master Plans for three industrial parks of APIIC namely,

i. APSEZ - Vizag;

ii. MPSEZ - Nellore; and

iii. GIP - Jedcherla.

The expert from BuroHappold Engineering made relevant presentations and undertook the training. Presentations on the status of the 3 industrial parks were made by the General Manager (EMP) of APIIC. During the orientation programme, three working groups were formed, each of which worked on the missing aspects/infrastructure in the existing industrial parks and on what should be incorporated in the re-planning. (Refer image no. 1-2).

4 Indo-German Environment Partnership (IGEP) Programme of the Indo German Development Corporation, www.igep.in

5 http://www.igep.in/e48745/e49028/e56645/#e57644

Image no. 1-2: Orientation programme for APIIC officials

[Source: GIZ-IGEP]

Three Day Training Programme for Government Officials

A 3-day training programme was conducted from October 9-11, 2013. The programme concentrated on the development of an industrial park. This was followed by intense discussions among the participants. Three groups were formed to work on GIP Jadcherla. The participants were given the task to analyze the short-comings in the Site Master Plan and to discuss appropriate solutions. (Refer image no. 1-3, 1-4, 1-5, 1-6)

Each team came out with a five year plan for the development of GIP Jadcherla based on the priorities and requirements as assessed by them for the industrial park. The long duration of the workshop and the formation of small groups allowed for a more detailed introduction and discussion of key themes as water, mobility, social inclusion etc. Teams were asked to work on surface water drainage strategies from green roofs to the final settling pond and discharge, and to find the preferred locations for the GIP. The participants were encouraged to find potential opportunities for new thinking and/or technologies to prepare them for discussions with key stakeholders and authorities in real life.

Image no. 1-3: Brainstorming over previous master plan of GIP Jadcherla by group -1

[Source: GIZ-IGEP]

Image no. 1-4: Group - 2 marking location of facilities over previous master plan of GIP Jadcherla
[Source: GIZ-IGEP]

Image no. 1-5: Training participants presenting their concepts for GIP Jadcherla
[Source: GIZ-IGEP]

Image no. 1-6: Participants of three day training programme

[Source: GIZ-IGEP]

The trainings led to a deeper understanding of the practical issues of the GIP Jadcherla site and produced applicable recommendations from BuroHappold Engineering, DGNB as well as GIZ-IGEP. (Refer map no. 1-2, table no. 1-2)

Map no. 1-2: Outcomes of the working group

[Source: GIZ-IGEP]

The inputs from the participants for improving the Site Master Plan of GIP Jadcherla are shown in the Map no. 1-2.

Table no. 1-2: Inputs by teams during training

S.No.	Plan and components
1.	**First year plan** - Roads - Storm water drains/ Water management - Street lights - Plantations/ Landscaping/ Green buildings - Green building concepts - Administrative building
2.	**Second year plan** - Public transport - Information kiosk - Recreation areas - CFC-Fire/ Ambulance - Primary health centre - Car /Truck parking - Water supply
3.	**Third year plan** - STP/ CETP - Solar renewable energy - Cycle track - Solid waste management

Rating and finalization Workshop on "Site Master Plan of GIP Jadcherla"

A 2-day workshop was conducted for finalization of the Site Master Plan of the Green Industrial Park, Jadcherla (near Hyderabad in Telangana) on 7-8 October 2014 for the officials of the Telangana State Industrial Infrastructure Corporation Ltd. (TSIIC). The programme was attended by 9 participants from head office as well as zonal office of TSIIC.

A senior consultant of Buro Happold Cities was the principal resource person for this programme. He is a LEED GA (Leadership in Energy & Environmental Design - Green Associate) and DGNB Auditor.

The workshop focused on assessment of the Site Master Plan of GIP Jadcherla as per DGNB rating system taking into consideration provisions such as the basic and technical infrastructure in the Site Master Plan, including:

- Transportation/circulation systems, renewable energy systems
- Rain water, waste water, solid waste management
- Common infrastructure and services

The methodology of the workshop was a mix of interactive presentations. An interactive hands-on exercise was also conducted in which the participants presented their ideas about GIP Jadcherla for further greening the industrial park. (Refer image no. 1-7).

Image no. 1-7: Impressions from two day workshop

[Source: GIZ-IGEP]

As a result of the workshop, the preliminary assessment of the Site Master Plan showed that the site covered several aspects of the DGNB rating system and a formal process of DGNB certification could be initiated targeting silver or higher rating.

Chapter 02
'Green' Rating Systems, Standards and Planning Considerations

A. DGNB Rating System

The German Sustainable Building Council[6] (DGNB) provides a certification system based on international codes and standards making it easy to use in various countries while at the same time providing high quality and transparency. The DGNB System is the first, and to date only system worldwide, in which the procedure to rate buildings in different countries is an integral part of the system itself. This adaptation takes into account different climatic zones, associated cost-benchmarks, and a specific database for life-cycle assessment, within which the datasets for all European countries are made available.

Its distinguishing feature is the integrated evaluation of economic and environmental aspects as well as user comfort. The system is used internationally, whereby the DGNB pre-certificate in particular makes it an ideal design tool and is the only one worldwide that is applicable for industrial districts. The DGNB system covers all of the key aspects of sustainable building: environmental, economic, sociocultural and functional aspects, technology, processes and site. (Refer image no. 2-1) The DGNB has defined target values for each criterion. The concrete score for the 5 quality sections is calculated from the combination of the assessment points with the relevant weighting.

The main benefit of this system is that it provides assistance from initial concept to final completion. This highlights potential errors and deficiencies at an early stage and makes quality measurable and transparent. The certification process is done by the auditor. The contractor selects a suitable DGNB auditor that he can trust; and enters into a contract with the auditor and a certification contract with the DGNB. The auditor supports the contractor and supervises the process from registration via the certification up to the conclusion. There is no contractual relationship between the DGNB and the auditor in order to guarantee the greatest possible degree of objectivity and independence.

Image 2-1: DGNB main criteria groups for rating of industrial parks
[Source: Buro Happold Engineering, Germany]

6 http://www.dgnb-system.de/en/schemes/scheme-overview/?pk_campaign=evtilesystem

Table no. 2-1: DGNB parameters for industrial districts[7]

Criteria	Indicator		
A. ENVIRONMENTAL QUALITY			
Effects on the Global and Local Environment Performance	**ENV1.1**	**Life Cycle Assessment (LCA)-emissions**	
	ENV1.1.1		Global warming potential (GWP)
	ENV1.1.2		Ozone depletion potential (ODP)
	ENV1.1.3		Photochemical oxidants potential (POCP)
	ENV1.1.4		Acidification potential (AP)
	ENV1.1.5		Eutrophication (EP)
	ENV1.1.6		LCA new building
	ENV1.2	**Pollutants and risk substances**	
	ENV1.2.1		Risks of the new buildings
	ENV1.2.2		Risks of the existing buildings
	ENV1.4	**Biodiversity**	
	ENV1.4.1		Individual measures to protect species
	ENV1.4.2		Biotope area factor
	ENV1.5	**UrbanClimateImpact**	
	ENV1.5.1		**Urban Climate Index District Surface Area**
	ENV1.5.2		Measures therm. Effect complex
	ENV1.5.3		Opinion therm. Effect complex
	ENV1.5.4		Cold air production areas
	ENV1.5.5		Fresh air corridors
	ENV1.5.6		Regional ventilation
	ENV1.5.7		Measures air exchange
	ENV1.5.8		Opinion on air exchange
	ENV1.6	**Environmental risk**	
	ENV1.6.1		Environmental risk 1 (Earthquake)
	ENV1.6.2		Environmental risk 2 (Storm)
	ENV1.6.3		Environmental risk 3 (Flooding)
	ENV1.7	**Water and soil protection**	
	ENV1.7.1		Ground water vulnerability
	ENV1.7.2		Biological and chemical water quality
	ENV1.7.3		Water structure
	ENV1.7.4		Degree of sealing

7 Blue collar Green II: Planning of new industrial parks and investment zones (2015), Buro Happold Engineering, Berlin

Criteria	Indicator		
Resource Use and Waste Generation	**ENV2.1**	**Life cycle assessment-primary energy**	
	ENV2.1.1		Non-renewable primary energy demand
	ENV2.1.2		Total primary energy demand
	ENV2.1.3		Share of renewable primary energy
	ENV2.2	**Demand for drinking water and waste water production**	
	ENV2.2.1		Derivative u. Treatment process water
	ENV2.2.2		Use of recycled process water in the production
	ENV2.2.3		Use of biological treatment systems for operational and process water
	ENV2.2.4		Use of non-potable water in the production
	ENV2.2.5		Use of non-potable water for irrigation factory internal open spaces
	ENV2.2.6		Use of non-potable water in buildings
	ENV2.2.7		Blackwater
	ENV2.3	**Landuse**	
	ENV2.3.1		Brown field share
	ENV2.3.2		Surface integration
	ENV2.3.3		Contaminated sites
	ENV2.3.4		Ordinance
	ENV2.4	**Resource-saving infrastructure, Soil management**	
	ENV2.4.1		Resource-saving building material choice
	ENV2.4.2		Recycling materials
	ENV2.4.3		Materials from renewable raw materials
	ENV2.4.4		Local and regional materials
	ENV2.4.5		Certified Building products
	ENV2.4.6		Plant material with regional origin
	ENV2.4.7		Earth masses management
B. ECONOMIC QUALITY			
Life Cycle Costs	**ECO1.1**	**Life cycle costs**	
	ECO1.1.1		LCC quantitative
	ECO1.1.2		LCC qualitative
	ECO1.2	**Socio economic effects on the community**	
	ECO1.2.1		Quantitative effects
	ECO1.2.2		Qualitative effects-local work force binding
Performance	**ECO2.1**	**Flexibility and conversion ability**	
	ECO2.1.2		Flexible location
	ECO2.1.2		Mutability factory building
	ECO2.1.3		Mutability factory site

Criteria	Indicator		
Performance	**ECO2.3**	**SpaceEfficiency**	
	ECO2.3.1		Development efficiency
	ECO2.3.2		Building density
	ECO2.3.3		Production process
	ECO2.4	**Valuestability**	
	ECO2.4.1		Diversification
	ECO2.4.2		Unemployment rate
	ECO2.4.3		Purchasing power index
	ECO2.4.4		Training mixture
C. SOCIAL QUALITY			
	SOC1.6	**Open space**	
	SOC1.6.1		Identity-effect
	SOC1.6.2		Thermal comfort of open spaces
	SOC1.6.3		Spaces per employee per shift
	SOC1.6.4		Accessibility of in-house clearances
	SOC1.7	**Safety**	
	SOC1.7.1		Occupational safety and health
	SOC1.7.2		Fire protection
	SOC1.7.3		Occupational safety organization
	SOC1.7.4		Plant protection
	SOC1.7.5		Hazardous substances
	SOC1.7.6		Risks from transport and traffic
	SOC1.8	**Work place comfort**	
	SOC1.8.1.1		Planning guidelines new-other
	SOC1.8.1.2		Planning guidelines new-office
	SOC1.8.1.3		Planning guidelines new-labs
	SOC1.8.1.4		Planning guidelines new-production
	SOC1.8.1.5		Planning guidelines new-logistics
	SOC1.8.2.1		Inventory analysis
	SOC1.9	**Emissions**	
	SOC1.9.1		Air Quality
	SOC1.9.2		Noise levels at the certification limit
	SOC1.9.3		Noise by additional traffic generation
	SOC1.9.4		Noise within the industrial site
	SOC1.9.5		Lighting quality
Function-ality	SOC2.1		Accessibility
	SOC2.1.1		Accessibility of the open space
	SOC2.1.2		Accessibility of the building

Criteria	Indicator		
Design quality	**SOC3.4**	**Urban integration**	
	SOC3.4.1		Involvement in the mobility network
	SOC3.4.2		Involvement in urban for mu-. Structure
	SOC3.4.3		Scenic integration
	SOC3.4.4		Functional integration
	SOC3.4.5		Involvement in plant development program
	SOC3.5	**Design quality**	
	SOC3.5.1		Design of open space/amenity
	SOC3.5.2		Design of architecture
	SOC3.5.3		Art on location
	SOC3.5.4		Measures to implement
	SOC4.2	**Infrastructure**	
	SOC4.2.1		Kindergarden, child care
	SOC4.2.2		Educational institution
	SOC4.2.3		Culture (association, religion, museum, gallery)
	SOC4.2.4		Restaurant, Bar
	SOC4.2.5		Local supply and services
	SOC4.2.6		Medical care
	SOC4.2.7		Outlet, Factory outlet, Factory museum
	SOC4.2.8		Customer centre
	SOC4.2.9		Training building
	SOC4.2.10		Factory sports club with sports grounds, gym
	SOC4.2.11		Supply
	SOC4.2.12		ATM
	SOC4.2.13		Supported by work-childcare/day care centre
	SOC4.2.14		Promoted by the factory – sports club, plant
	SOC4.2.15		Promoted by the factory – staff housing
	SOC4.2.16		Promoted by the factory – miscellaneous
D. TECHNICAL QUALITY			
Quality of technical design	**TEC1.5**	**Maintenance, care and cleaning**	
	TEC1.5.1		Surface texture traffic areas
	TEC1.5.2		Easy road and route guide
	TEC1.5.3		Undeveloped green spaces
	TEC1.5.4		Site-adapted native plants
	TEC1.5.5		Easy-care water surfaces
	TEC1.5.6		Technology and lighting

Criteria	Indicator		
Quality of technical design	**TEC2.1**	**Energy Technology**	
	TEC2.1.1		Coverage rate of self-sufficiency
	TEC2.1.2		Energy efficiency
	TEC2.1.3		Flexibility and security of supply
Technical Infrastructure	**TEC2.2**	**Recycling and waste management**	
	TEC2.2.1		Waste management
	TEC2.2.2		Waste avoidance in the factory
	TEC2.2.3		Waste prevention product/packaging
	TEC2.2.4		Waste recycling
	TEC2.2.5		Waste disposal
	TEC2.3	**Storm Water Management**	
	TEC2.3.1		Field water balance
	TEC2.3.2.1		Rain water cisterns
	TEC2.3.2.2		Use of discreet. RW measures
	TEC2.3.2.3		Free areas as wet lands
	TEC2.3.2.4		Channel storage tube with retention volume
	TEC2.3.2.5		Ponds as storm water retention basin
Mobility	**TEC3.1**	**Mobility Infrastructure**	
	TEC3.1.1		Traffic Connection
	TEC3.1.2		Vehicle offer
	TEC3.1.3		Quality of development
	TEC3.1.4		Intermodal platforms
	TEC3.1.5		Timing of public transport
	TEC3.1.6		Design of public transport stops
	TEC3.1.7		Quality and management of the bicycle network
	TEC3.1.8		Stabling quantitatively
	TEC3.1.9		Stabling qualitatively
	TEC3.1.10		Guidance systems
Mobility	TEC3.1.11		Pedestrian network
	TEC3.1.12		Signalisation
	TEC3.6	**Logistics concept**	
	TEC3.6.1		Storage
	TEC3.6.2		Turnover
	TEC3.6.3		Material flow
	TEC3.6.4		Gates and control centre

Criteria	Indicator		
E. PROCESS QUALITY			
Quality of planning	**PRO1.2**	**Integrated Planning (New Buildings)**	
	PRO1.2.1		Integrated planning team
	PRO1.2.2		Cooperation of the planning Team
	PRO1.2.3		Integration of sustainability criteria
	PRO1.3	**Optimization of planning (New Building)**	
	PRO1.3.1		Goal planning
	PRO1.3.2		Preparatory work
	PRO1.3.3		Planning (big scale)
	PRO1.3.4		Planning (detailed)
	PRO1.3.5		Implementation planning and execution
	PRO1.6	**Participation**	
	PRO1.6.1		PP-Business development concept
	PRO1.6.2		PP-Social spaces
	PRO1.6.3		PP-Production facilities and architecture
	PRO1.6.4		PP-Using phase
	PRO1.6.5		Ausw.PP–Business development concept
	PRO1.6.6		Ausw.PP–Social spaces
	PRO1.6.7		Ausw.PP–Production facilities and architecture
	PRO1.7	**Planning concepts**	
	PRO1.7.1		Variant of LCA comparisons
	PRO1.7.2		Soil protection concept with post-closure plan
	PRO1.7.3		Biotope networking concept
	PRO1.7.4		Integrated water concept
	PRO1.7.5		Variant comparisons lifecycle cost planning
	PRO1.7.6		Concept of functional mix of uses
	PRO1.7.7		Integrated energy concept
	PRO1.7.8		Integrated traffic concept
	PRO1.7.9		Integral business development concept
Quality of construction	**PRO2.1**	**Construction site, construction process (new construction)**	
	PRO2.1.1		Logistics
	PRO2.1.2		Waste
	PRO2.1.2		Waste
	PRO2.1.3		Noise
	PRO2.1.4		Dust

Criteria	Indicator		
Quality of construction	PRO2.1.5		Environmental and nature protection
	PRO2.2	**Quality Assurance and Monitoring**	
	PRO2.2.1		Environmental management
	PRO2.2.2		Energy management and monitoring
	PRO2.2.3		Water management and monitoring
	PRO2.2.4		Facility management
	PRO2.2.5		Corporate social responsibility
	PRO2.4	**Control (NewBuildings)**	
	PRO2.4.1		Project management
	PRO2.4.2		Quality assurance
	PRO2.4.3		Scheduling
	PRO2.4.4		Cost control

Source: Buro Happold Engineering, Germany

The total score for the overall project is calculated from the five quality sections based on their weighting. Based on the DGNB matrix, a rating can be derived for each industrial park. (Refer table no. 2-2)

Table no. 2-2: Weightage for DGNB certification

S. No.	Certification level	Points
1	Bronze	If the total score is at least 50 percent
2	Silver	If the total score is at least 65 percent
3	Gold	If the total score is at least 80 percent

Source: Buro Happold Engineering, Germany

B. IGBC Rating System

The Green Building movement in India has been spearheaded by the Indian Green Building Council[8] (IGBC) since 2001. The council's activities have enabled a market transformation with regard to green building concepts, materials, and technologies. The rating programme is a tool which enables the designer to apply green concepts and criteria, so as to reduce the environmental impacts, which are measurable.

IGBC has five rating systems out of which two rating systems are in the context of industrial parks:

- IGBC Green Factory Building Rating System
- IGBC Green SEZs Rating Systems

8 http://www.igbc.in/site/igbc/index.jsp

IGBC Green Factory Building Rating System:

IGBC has set up the Core Committee to develop and maintain the ratings continued relevance to the industry. The committee constitutes industrial entities, academia, government, manufacturers, and institutions to provide strategic inputs and guidance. The diversity in the professions and experience of the members brings a holistic perspective to the process of developing the rating programme.

IGBC Green Factory Building Rating System is a voluntary and consensus based programme. The rating system has been based on materials and technologies that are currently available. This rating system facilitates the development of energy efficiency, water efficiency, health and more productive, environmentally friendly factories. The rating system evaluates certain credit points using a prescriptive approach and other credits on a performance based method. The rating system is evolved so as to be comprehensive and simultaneously user-friendly. The programme is designed to address national priorities and quality of life for factory employees.

The IGBC Green Factory Building Rating addresses both new and existing factory buildings. The existing factory buildings should address the following measures before applying for certification:

- Soil erosion control measures in future
- Changes in design to accommodate requirements of differently abled people, like easy access to lifts, rest rooms etc.
- Change to low flow water fixtures
- Rainwater harvesting
- Limit turf areas
- Have policy for use of green materials in future
- Minimum fresh air ventilation
- Comfort conditions
- Use eco-friendly housekeeping materials

The rating system is valid for three years. Upon completion of the three years, projects can be validated/ renewed based on the prevailing latest version. The guidelines detailed under each credit enable the design and construction of green factory building of all sizes and types.

IGBC Green Factory Building Rating addresses green features under the following categories:

- Site selection and planning
- Water conservation
- Energy conservation
- Material conservation
- Indoor environment quality and occupational health

Different levels of green building certification are awarded based on the total credits earned. However, every green factory building should meet certain mandatory requirements, which are non-negotiable.

The various levels of rating awarded are:

- “Certified” to recognize best practices;
- “Silver” to recognize outstanding performance;
- “Gold” to recognize national excellence; and
- “Platinum” to recognize global leadership.

Green factory building rating can have tremendous benefits, both tangible and intangible. The most tangible benefits are the reduction in water and energy consumption right from the first day of occupancy. Energy savings could range from 30 – 40 % and water savings between 20 – 30%. Intangible benefits of a green factory include enhanced indoor air quality, good day lighting, health, well-being, and safety of the workforce.

IGBC Green SEZ Rating System:

The Special Economic Zones (SEZ) policy was announced in April 2000, with an intention to make SEZs, supported by quality infrastructure, an engine for economic growth. The Indian Green Building Council along with the Ministry of Commerce & Industry prepared the 'Green SEZ guidelines'. The IGBC Green SEZ rating system is a voluntary and consensus-based programme. The rating system has been developed based on materials and technologies that are presently available. The objective of IGBC green SEZ is to facilitate the creation of energy efficient, water efficient, healthy, comfortable, and environmentally friendly SEZs.

The rating system evaluates certain credit points using a prescriptive approach and other credits on a performance-based approach (refer table no. 2-3). The rating system is evolved so as to be comprehensive and simultaneously user-friendly. The rating programme uses well accepted national standards and, wherever local or national standards are not available, appropriate international benchmarks are considered.

Various criterions and their basis are as follows:

Table no. 2-3: Weightage for IGBC green SEZ rating

S. No.	Criterion		Maximum points	Basis
A	**Site Preservation & Restoration**			
a.i	Mandatory Requirement 1	Local regulations	Required	SEZ status from MoCI[9], Approval of the plan from the competent Government authority
a.ii	Mandatory Requirement 2	Soil erosion	Required	Soil erosion control measures shall conform to best management practices highlighted in National Building Code (NBC) 2009 of India. Reuse top soil for landscaping
a.iii	Mandatory Requirement 3	Nurseries	Required	Developer/ co-developer must set up their own nurseries for plantation of saplings
a.iv	SPR Credit 1	Reduce site disturbance	4	Preserve or transplant at least 75%, 95% of existing trees, Protect or restore atleast 50%-95% of the existing water bodies (by area) to promote biodiversity
a.v	SPR Credit 2	Landscape open areas, 50%, 75%	4	Landscape open areas to an extent of at least 50% of the zone area
a.vi	SPR Credit 3	Reduce impact on microclimate: non-roof	2	For surface parking and other non-roof impervious areas (walk ways, etc.), provide shade (within 5 years) and / or open grid pavement for at least 30% of such areas.

9 MoCI stands for Ministry of Commerce and Industry

S. No.	Criterion		Maximum points	Basis
a.vii	SPR Credit 4	Reduce impact on microclimate: roof, 50%, 75%	4	Install at least 50% of the roof area with green roof or high reflective materials (SRI > 78)
a.viii	SPR Credit 5	Night sky pollution reduction	2	Lighting power densities should not exceed 80% for exterior areas and 50% for building facades
			16	
B	**Site Planning & Design**			
b.i	Mandatory Requirement	Tobacco smoke control	Required	Smoking should be prohibited in all common/ public areas.
b.ii	SPR Credit 1	Basic amenities	3	Provide at least ten amenities such as ATM/ bank, coffee shop, community center, day care, fire station, fitness center, hotel, internet centre, library, medical clinic, pharmacy, place of worship, post office, restaurant, sports club, etc., within the zone. Provide Optical Fiber Communications (OFC) for efficient internet connectivity to the units
b.iii	SPR Credit 2	Vicinity to public transport	1	Provide access to public transportation such as public bus station or railway station, within a distance of 1 km of any access point to the zone.
b.iv	SPR Credit 3	Bicycle lanes	2	Provide bicycle lanes (in all primary and secondary streets) to encourage occupants to commute by bicycles to and from the work place.
b.v	SPR Credit 4	Footpaths and pathways	4	Provide exclusive foot paths in primary streets for comfortable pedestrian street access. Provide pedestrian pathways across various blocks in the zone
b.vi	SPR Credit 5	Eco-friendly transportation, 10%, 20%	5	Provide internal transportation facilities in the zone to cater to atleast 10% of the permanent occupants through low emission vehicles, provide alternate fuel stations
b.vii	SPR Credit 6	Parking facilities	2	Provide parking facilities to meet but not exceed the local parking regulations. Allocate at least 10% of the parking capacity for carpool vehicles
b.viii	SPR Credit 7	Design for differently abled	2	Design for easy access to all the common spaces
b.ix	SPR Credit 8	Green buildings within the SEZ, 25%, 50%, 75%	6	Design individual buildings within the SEZ in accordance with the appropriate IGBC rating system
			25	

S. No.	Criterion		Maximum points	Basis
C	**Water Efficiency**			
c.i	Mandatory Requirement 1	Rainwater harvesting, 25%	Required	Provide rainwater harvesting or a storage system to capture at least 25% of 5-year average one day rainfall from non-roof & roof areas
c.ii	Mandatory Requirement 2	Waste water treatment, 100%	Required	Provide an on-site waste water treatment system to treat 100% of waste water generated (industrial & non-industrial) in the zone
c.iii	WE Credit 1	Lawn design, 30%, 20%	2	Limit the use of lawn to an extent of 20% (minimum) of the landscaped area (both ground and terrace)
c.iv	WE Credit 2	Drought tolerant species, 25%, 50%	2	Design landscape with plant species which consume less water, to an extent of 25% of landscaped area
c.v	WE Credit 3	Efficient irrigation systems	2	Provide highly efficient irrigation systems
c.vi	WE Credit 4	Rainwater harvesting, 50%, 75%	4	Provide rainwater harvesting or storage system to capture at least 50% of 5-year average one day rainfall from non-roof & roof areas
c.vii	WE Credit 5	Rain water filtration	1	Construct on-site storm water treatment systems designed to remove 80% of the average annual post-development total suspended solids (TSS)
c.viii	WE Credit 6	Treated waste water reuse, 50%, 75%	4	Reduce at least 50% of water requirement by using treated waste water for landscaping
			15	
D	**Energy Efficiency**			
d.i	Mandatory Requirement	Minimum energy efficiency	Required	
d.ii	EE Credit 1	Energy efficiency, 10%, 12.5%,15%, 17.5%, 20%, 22.5%, 25%, 27.5%, 30%	12	Optimize energy efficiency of the building and systems to reduce environmental impactsfrom excessive energy use.
d.iii	EE Credit 2	Onsite renewable energy, 5%, 7.5%, 10%, 12.5%, 15%	5	Install renewable energy systems to generate power through solar, wind, bio-mass/ biogas, or any other forms of renewable energy for at least 5% of the annual consumption (in developer's/ co-developer's scope).
d.iv	EE Credit 3	Energy monitoring system	2	Develop and implement, a Measurement & Verification (M&V) plan to monitor building performance
d.v	EE Credit 4	HCFC (Hydro Chloro Fluoro Carbon) free air-conditioning systems	1	Avoid the use of HCFC based refrigerants and ozone depleting gases which negatively impact the environment.

S. No.	Criterion		Maximum points	Basis
d.vi	EE Credit 5	Off-Site green power, 25%, 50%	10	Demonstrate the project has invested in off-site green power for at least 25% of the annual energy consumption in developer's scope for atleast 2 years
			30	
E	**Materials & Resources**			
e.i	Mandatory Requirement	Segregation of waste: post occupancy	Required	Develop a waste management plan and identify methods to segregate & dispose of the waste efficiently.
e.ii	MR Credit 1	Waste reduction: during construction, 50%, 75%	2	Avoid at least 50% of the waste generated during construction from being sent to landfills and incinerators
e.iii	MR Credit 2	Organic waste management: Post occupancy, 50%, 75%	2	Install on-site treatment plant to treat at least 50% of organic waste generated in the zone.
e.iv	MR Credit 3	Materials with recycled content, 10%, 20%	2	Select materials having recycled content such that the total recycled content constitutes at least 10% of the material
e.v	MR Credit 4	Local materials, 50%, 75%	2	Ensure atleast 50% of the building materials (by cost; civil & interior materials only) are sourced locally within a radius of 500km
e.vi	MR Credit 5	Low volatile organic compounds (VOC) materials: adhesives & sealants and paints & coatings	2	For adhesives and sealants used within the interiors, ensure that the VOC[10] content does not exceed the limits as specified in the table no. 2-4.
			10	
F	**Innovation and Design Process**			
f.i	ID Credit 1	Innovation & design process	3	Provide design teams and projects the opportunity to be awarded points for innovative performance in green building categories not specifically addressed by the IGBC Green SEZ Rating System.
f.ii	ID Credit 2	IGBC accredited professional	1	At least one principal participant of the project team shall be an IGBC accredited professional
			4	
	Total Points		**100**	

*Note: Different point are awarded for different percentage levels

10 VOC stands for Volatile Organic Compound

Table no. 2-4: VOC for materials

S. No.	Type of material	VOC Limits in grams/litre (less water)
a	**Adhesives & Sealants:**	
1	Multipurpose construction adhesives	100
2	Pane; adhesives	50
3	Sheet applied rubber lining operations	850
4	Structural glazing adhesive	100
5	Tile adhesive	65
6	Wood Adhesive	30
b	**Paint coatings:**	
1	Anti-corrosive / anti-rust paints	250
2	Flat paints (Mat)	50
3	Non flat paints (Glossy)	150
4	Primers	50
5	Wood varnish	350

As shown above, the guidelines detailed under each mandatory requirement and credit enables the design and construction of green SEZs of all sizes and types. IGBC Green SEZ addresses green features under the following categories: site preservation & restoration, site planning & design, water efficiency, energy efficiency, materials & resources and innovation & design process. The threshold criteria for certification levels are listed in the following table:

Table no. 2-5: Criterion for certification – IGBC

S. No.	Certification level	Points	Recognition
1	Certified	51-60	Best practices
2	Silver	61-70	Outstanding performance
3	Gold	71-80	National excellence
4	Platinum	81-100	Global leadership

Different levels of green building certification are awarded based on the total credits earned. However, every green SEZ should meet certain mandatory requirements, which are non-negotiable.

C. DTCP Site Layout Standards

The GIP Jadcherla Site Master Plan or layout plan of the industrial parks in Telangana has to be approved by the Directorate of Town and Country Planning (DTCP) of the state. In absence of new rules for state of Telangana

In absence of new rules for state of Telangana, a series of Government Orders (G.O.s) of the Government of Andhra Pradesh were studied to compile the norms and standards for various components of the layout.

The relevant documents were reviewed, keeping a focus on the relevant components for the industrial area/ park. These components are:

- Scale and components of drawings
- Layout and subdivision regulations
- Building activities restriction around water bodies

- Water bodies
- Electricity lines
- Road and Cul-de-sacs
- Social infrastructure

Relevant excerpts from the standards are compiled in Table2-6.

Table no. 2-6: Summary of standards

S. No.	Category	Norms and standards	Source
1	Scale and Components	The application for permission of individual industries shall be accompanied by, - (i) A **site plan** drawn to scale of not less than **1:1000** showing all physical details of the land, boundaries of the land, the surrounding existing layouts/lands, and existing approach roads to the land where the layout is proposed; (ii) A **layout plan** (in required number of copies) drawn to a scale of not less than **1:500** showing boundaries of land, proposed number of building plots with dimensions and area of each plot, and its uses as per these rules; alignment and width of the proposed streets/roads; dimensions and areas of open space, provided according to these rules	Part A, rule 3 *The Andhra Pradesh Gram Panchayat Land Development (Layout and building) Rules – 2002 G.O. no. 67*
2	Layout Sub-Division Regulations	The layout proposal shall conform to the following requirements: (a) **Minimum width of proposed roads** in the layout shall be 10m for residential roads and **12 m for all non-residential road layouts.** Notwithstanding the above minimum width, the Executive Authority may insist upon larger road widths depending upon local conditions or importance of any particular road etc., as exhibited in Table 2-7. The width of the roads in the layouts shall be in conformity with the General Town Planning Scheme or the Indicative Land Use Plan or Master Plan, if any in force; (b) **Minimum open space** set apart in the proposed layout for playground/park/educational institution or for any other public purpose shall be at the rate of **10% of the total site area.** (c) **The minimum plot size for non-residential layouts** shall be **300 m^2** except in cases of **commercial** or mercantile buildings, for which the minimum plot size shall be **18 m^2.**	Part A, rule 4 *The Andhra Pradesh Gram Panchayat Land Development (Layout and building) Rules – 2002 G.O. no. 67*

3	Building activities restriction around water bodies	Restrictions of building activity in vicinity of certain areas: (a) no building activity shall be allowed in the bed of water bodies like rivers, lakes, ponds, or nala[11], etc., (b) no building activity shall be carried out within: (i) 30 m from the boundary of rivers and lakes of a surface area 10 Ha and above; (ii) 15 m from the boundary of lakes of a surface area less than 10 Ha (iii) 9 m from nalas, canals, etc.	Part B, rule 21 *The Andhra Pradesh Gram Panchayat Land Development (Layout and building) Rules – 2002* *G.O. no. 67*
4	Water Bodies	(i) No building / development activity shall be allowed in the bed of water bodies like rivers or nalas and in the Full Tank Level (FTL) of any lake, pond, cheruvu or kunta[12]/ shikam lands[13]. (ii) The above water bodies and courses shall be maintained as recreational/green buffer zones and no building activity shall be carried out within: (1) 100 m from the boundary of the river outside the Municipal Corporation / Municipality / Nagara Panchayat limits and 50m with in the Municipal Corporation / Municipality / Nagara Panchayat limits. The boundary of the river shall be as fixed and certified by the Irrigation Department and Revenue Department. (2) 30 m from the FTL boundary of lakes / tanks / kuntas of an area of 10 Ha and above. (3) 9 m from the FTL boundary of lakes / tanks / kuntas of an area less than 10 Ha / shikam lands; (4) 9 m from the defined boundary of canals, vagu, nala, storm water drain of a width of more than 10 m. (5) 2 m from the defined boundary of canals, vagu, nala, storm water drains of a width of up to 10 m.	Rule 3 (a) *The Andhra Pradesh Building Rules -2012. Municipal Administration and Urban Development Department* *G.O. no. 168*
5	Electrical lines	In case of electricity power lines, the land all along and below the power line shall be developed as a green belt to an extent of the width of the tower base; on either side of the green belt there shall be a minimum of 10 m wide roads or other thoroughfares, as defined in the Master Plan.	Rule 3 (c) *'The Andhra Pradesh Building Rules -2012'. Municipal Administration and Urban Development Department* *G.O. no. 168*

11 'nala' in Hindi means rivulet or storm water drain

12 Cheruvu and kunta are telugu words which mean Pond

13 Shikam means lake

6	Road And Cul-De-Sacs	Minimum width of the roads • 9 m to 18 m for main internal approach roads; • 9 m for other internal roads and also for looped roads. • 8 m for cul-de-sacs roads (with a minimum radius of 9 m) between 50-100 m length.	Rule 8 (M) *'The Andhra Pradesh Building Rules -2012'. Municipal Administration and Urban Development Department* *G.O. no. 168*
7	Social Infrastructure	(refer to Table 2-8)	*The Andhra Pradesh Gram Panchayat Land Development (Layouts and Building) Rules – 2002 – Amendments – Orders – Issued* *G.O. no. 274* *(Amendment to GO. 67)*

Table no. 2-7: Street standards

S. No.	Minimum permissible length of street	Function of the street	Minimum permissible width of street (m)	Minimum width of splay required at the junction of streets (m)	Minimum width of the passing for the carriage way of the street (m)	Remarks
1	Up to 50 m	Minor residential cul-de-sac street (dead end street) with 13 m x 13 m square space for free movement of vehicles at the dead end lane	8.00	12.00	4.00	This type of width can be permitted only at discretion of the Gram Panchayat and in consultation with the Director of Town and Country Planning
2	Up to 250 m	Minor residential loop street	10.00	16.00	6.00	Total length of the loop street shall not exceed 150 m and both ends of loop street shall join in having a width not less than 13.00 m.
3	Up to 600 m	Residential street	12.00	18.00	6.00	–
4	Exceeding 600 m	Residential collector street	18.00	24.00	10.00	–

Table no. 2-8: Social Infrastructure

S. No.	Type of facility	Sub-type	Scale	Minimum area required
1	Educational	Nursery school Primary school High school Degree college	1 for 4000 population 1 for 4000 population 1 for 16000 population 1 for 80000 to 1 lakhs[14] population	0.1. Ha 0.4 to 0.6 Ha 1.6 to 2.0 Ha 4 to 6 Ha
2	Health	General hospital	1 for every 16000 population	1.0 Ha
			1 for 80000 to 1 lakhs population	4 Ha for 200 beds and 4 Ha for quarters [15]
3	Commercial facilities	Shops	Upto 10 shops for 4000 population	0.05 to 0.01 Ha
			Upto 20 shops for 16000 population	0.40 Ha
			Upto 80 to 100 shops for 80000 population	2.05 Ha
4	Communication facilities and Essential Services	Sub-post office, post and tele-graph office-cum-delivery and booking telephone exchange for 1000 lines	1 for 100000 population	1.0 Ha
		Electrical sub-Station. Police Station	1 in all shopping centres 1 for every 50,000 population	12 X12 m 0.8 Ha
		Police Post	1 for every 20,000 population	0.4 Ha
		Fire Station	1 every 5 kms radial distance	0.8 Ha
5	Social and Cultural facilities	Religious building	1 for every 15,000 population	0.8 Ha (shall be at 60 m away from the street junctions)
		Community hall and library	1 for every 25,000 population	0.30 Ha with parking location in zonal shopping centre; business and commercial not in residential zone.

D. Statutory Requirements of Buffer Zone

Under 'Technical EIA Guidance Manual for Industrial Estates' from the Ministry of Environment and Forests, of the Government of India, the following guidelines have been mentioned:

- Planning and establishment: The State Industrial Development Corporations (SIDC) and Development Authorities (DA) will identify the alternative sites and control the land use in the region and within industrial complexes. Detailed master plans for the IE may be prepared indicating the phases of development and also in

14 1 Lakh stands for 0.1 million units

15 Quarter is a common term in India referring to Housing provided by an employer or by the government

defining the land use pattern for the surrounding buffer zone. This would ensure controlled development in the future.
[Page no 3-20; Note.]

- Under the section "steps involved in identification of a site" the following is mentioned:
  "The various steps involved in the identification of a suitable site for Industrial Estates (IE) include: Providing appropriate buffer zones around IEs."
  [Page no 3-27.]
- Under the section of "risk based land use planning", following is mentioned:
  "The use of adequate buffer zones within such industrial parks is particularly important and the use of site specific risk assessments is desirable."
  [Page no 3-32]
- Under section of "Emergency management", the following is mentioned:
  The four core elements of emergency management are:
  "Prevention/mitigation- land-use planning, dangerous goods corridors, buffer zones and process safety management of industry."
  [Page no 3-38]
- Under the section "terms of reference for EIA studies", the following is mentioned:
  Anticipated environmental impacts are:
  "Odour mitigation plan may be described. Also make provision of green cover as a measure for mitigation of dust and noise and buffer between habitation and industry."
  [Page no 4-20]
- Under the section "operational aspects of EIA", the following is mentioned:
  The EIA report will be typically examined for the following:
  "Project site description supported by topographic maps and photographs –detailed description of topography, land use and activities at the proposed project site and its surroundings (buffer zone) supported by photographic evidence."
  [Page no 4-49]

Above excerpts reiterate the importance of buffer zones for industrial parks for both functional as well as regulatory requirements.

E. Standards and Programmes Across States

Cluster Development Programme

The Cluster Development Programme (MSE-CDP)[16] of the Ministry of Micro, Small and Medium Enterprises (MSME), of the Government of India provides for the following in industrial clusters:

- Hard intervention/Common facility centers (CFCs): Creation of tangible 'assets' like testing facility, design centre, production centre, effluent treatment plant, training centre, research and development centre, raw material bank/sales depot, product display centre, information centre, any other need based facility.
- Infrastructure development: development of land, provision of water supply, drainage, power distribution, non-conventional sources of energy for common captive use, construction of roads, common facilities such as first-aid centre, canteen, other need based infrastructural facilities in new industrial (multi- product) areas/ estates or existing industrial areas/estates/clusters.

16 Modified Guidelines of MSE-CDP; Ministry of Micro, Small and Medium Enterprises (MSME), Government of India (GoI)

Mega Leather Cluster Development[17]

The leather industry in India provides jobs to about 2.5 million people. The main objective of developing Mega Leather Clusters is to create world-class infrastructure and to integrate the production chain in a manner that caters to the business needs of the leather industry so as to cater to the domestic market and exports. The suggested planning approach includes:

- **Extent:** The cluster should have a minimum area of 25 acres (to be set up without tanneries) and 40 acres (to be set up with tanneries) and the land development cost will include a secured compound wall, wire fence, and site development.
- **Core infrastructure:** Road network, power supply including installation of captive power plant, water supply system, water storage with rain harvesting facility, storm water drainage and sewage lines, streetlights, secured compound wall/wire fence, solid waste disposal plant/ common effluent treatment plant, signage, landscaping and entry-exit gate and parking facilities.
- **Social infrastructure:** Common facility centre which include warehouse, trade/ display/ exhibition/ convention/ information centre, design centre, craft based resources centre, hostel with dormitory, raw material bank and additional common facilities like communication network (including broadband service), administrative building, firefighting station, infrastructure to ensure better environment for differently abled. Provisions for a post office, health centre and primary school may be made by dovetailing with other Government of India/State Government schemes.
- **Production infrastructure:** Ready-to-use factory sheds with plug-in facility for machinery/ equipment.
- **HRD[18] and social infrastructure:** Training centres, recruitment centre, workflow training centre, classroom with LCD projector, library, recreation centre, workers' hostel, faculty room, crèche & canteen, labour restroom, and management consultancy centre.
- **R&D infrastructure:** Product design & development support centre, testing laboratory, quality benchmark centre, material research, basic product technology research, pre-competitive collaborative research and market research.
- **Export services related infrastructure:** Clearing agents, customs/ central excise/ service tax offices and DGFT[19] liaison office.

Handloom Cluster Development[20]

- The objective of developing Mega Handloom Clusters is to improve infrastructure facilities, with better storage facilities, technology up-gradation in pre-loom/on-loom/post-loom operations, weaving shed, skill up-gradation, design inputs, health facilities, etc. which would eventually be able to meet the discerning and changing market demands both at domestic and at the international level. The development of Mega Handloom Clusters could also raise living standards of the millions of weavers engaged in the handloom industry. The handloom clusters would include:
- A Common Facility Centre (CFC) to carry out warping, dyeing, pre and post loom operations, for setting up of a water treatment plant, effluent treatment plant, testing labs, common work shed for mass production, exhibition hall, display-cum-showroom, conference hall, warehouse, etc.
- Common infrastructure such as road connectivity to the clusters where there are no roads, repair of roads, street lighting, bore wells, renovation of primary school building and primary health centres, etc.

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17 Department of Industrial Policy & Promotion, Ministry of Commerce & Industry, Government of India.(n. d.). *Mega Leather Cluster Sub-Scheme of the Indian Leather Development Programme.* Retrieved from http://www.leatherindia.org/documents/pdf/guidelines_mega-leather-cluster.pdf

18 HRD stands for Human resource development

19 DGFT stands for Director General of Foreign Trade, Government of India

20 Ministry of Textiles, Government of India (n. d.). *Handloom Cluster Development Scheme (CHCDS) – Mega Handloom Cluster.* Handlooms. Retrieved from www.handlooms.nic.in

Industrial Park Scheme 2008[21]

- "Infrastructure facility" is defined as facilities required for development, operation, and maintenance of the industrial park and include roads (including approach roads), water supply, sewerage and effluent treatment facilities, solid waste management facilities, telecom network, generation and distribution of power, and air conditioning.
- The area allocated or to be allocated to industrial units shall not be less than ninety per cent of the allocable area.
- There shall be a minimum of thirty industrial units located in an industrial park.
- For the purpose of calculating the minimum number of industrial units; all units of a person and his associated enterprises will be treated as a single unit.
- The minimum constructed floor area shall not be less than 50,000 m^2.
- No industrial unit, along with the units of an associated enterprise, shall occupy more than twenty five per cent of the allocable area.
- The industrial park should be owned by only one undertaking.
- Industrial units shall undertake only manufacturing activity as defined in section D of the National Classification 2004 Code, issued by the Central Statistical Organization, Department of Statistics.

Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR)[22]

A Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR) would be a specifically delineated investment region with an area of around 250 km^2 planned for the establishment of manufacturing facilities for domestic and export led production in petroleum, chemicals, & petrochemicals, along with the associated services and infrastructure.

- A PCPIR would be a combination of production units, public utilities, logistics, environmental protection mechanisms, residential areas, and administrative services. The minimum processing area for the PCPIR will be about 40% of the total designated area, i.e., around 100 km^2. The processing area may or may not be contiguous.
- The PCPIR may include one or more special economic zones, industrial parks, free trade & warehousing zones, export oriented units, or growth centres, duly notified under the relevant central or state legislation or policy.
- The master plan will consist of a regional development plan specifying land use for processing and non-processing areas, as well as technical details regarding the number and nature of downstream units that may come up in the PCPIR, based on available feedstock.
- The basic infrastructure in PCPIR would include:
  a) Power connectivity and availability of reliable and good quality power. The units may also seek open access as per the regulations of the State Electricity Regulator Commission;
  b) Provision of bulk requirements of water;
  c) Road connectivity (State roads); and
  d) Sewerage and effluent treatment linkages from the edge of the PCPIR to the final disposal sites.
- The site should have port connectivity/port condition.
- Available draft, existing facilities, and natural calamity risk should be considered.

21 Industrial Park Scheme 2008, Department of Revenue, Ministry of Finance, GoI; http://incometaxindia.gov.in/archive/IndustrialParkScheme_04072008.pdf

22 Policy Resolution for Promotion of Petroleum, Chemicals and Petrochemical Investment Regions (PCPIRs), Ministry of Chemicals and Fertilizers, GoI; http://chemicals.gov.in/PCPIRPolicy.pdf

- Ecological balance and sustainable development in the region should be ensured. Also, conformity with environmental laws in force should be ensured.

State level guidelines/standards: At the State level too, there are no explicitly defined standards and guidelines for site master plans or development plans for industrial estates and industrial investment zones.

Gujarat

The Government of Gujarat has 'Guidelines for Planning of Industrial Parks'[23]. Highlights are given below:

- Industrial Park should be provided link infrastructure, viz. such as such as road, including toll road, bridges, runways, and other airport facilities; transmission or distribution of power by laying a network of new transmission or distribution lines of electricity; telephone lines telecommunications network; pipelines for water, crude oil, slurry, waterways, port facilities; canal networks for irrigation, sanitation or sewerage, and waste/solid waste, water pipe line; railway tracks, signaling system, stations; gas pipe line.
- The overall planning and layout should provide a maximum of 70% processing area; 20% of allocable area is for development of roads, industrial infrastructure, and other amenities. Subsequently, if the developer desires, 20% area can be utilized for utility, housing, and amenities.
- The overall planning and layout should provide a minimum of 20% of the land area for the development of roads. Roads may be categorized as follows:
  - Main entrance or approach road - width not less than 30 m;
  - Trunk roads - width not less than 20 m; and
  - Tertiary roads - width not less than 12 m.
- Cross section of the road should accommodate a storm water drain of adequate size, shape, and cross section. Footpaths should be of flexible/replaceable material of construction. Street light should be provided on either side of the road. In the case that a central median is provided on the road, the street light should be set up there.
- Provision of common open space area, utility plots or public purpose areas shall be governed by the General Development Control Regulation (GDCR) of the concerned Urban Development Authority or the competent authority approving the detailed development plan.
- The developer should provide source and transmission of power within the park at the planning stage. The developer should provide source of water, conveyance, treatment, adequate storage and distribution within the park. The developer shall design the waste water handling system for the capacity of 80% of the water quantity to be supplied to the industries. The developer should make sufficient provision of land for collection, treatment, and disposal of solid waste arising out of the park.

The 'Guidelines for Preparing the Master Plan of SEZ Areas'[24] of Gujarat details the contents of the master plan:

- Proposals for designating the use of the land for residential, commercial, industrial, and recreational purposes;
- Proposals for the designation of land for public purposes;
- Proposals for transport, communications, water supply, drainage, sewage disposal, other public utility amenities, and services, including the supply of electricity and gas;
- Proposals for designation of sites for service industries, general industries, obnoxious and hazardous industries;
- Provisions for preventing or removing pollution of water or air, caused by the discharge of waste or other means as a result of the use of land;

23 Government of Gujarat. (2011). *Scheme for Financial Assistance to Industrial Park-Guidelines for Planning of Industrial Parks.*

24 Government of Gujarat. (2004). *Guidelines for preparing a master plan of SEZ area for the purpose of section 6(2)(b) and 13(1)(a) of the Gujarat Special Economic Zone Act.* Retrieved fromhttp://ic.gujarat.gov.in/wp-content/uploads/2011/03/sez_guideline.pdf

- Provision of general development control regulation for controlling and regulating the use and development of land within the development area, including imposition of conditions and restrictions in regard to the open space to be maintained for buildings, the percentage of building area for a plot, the locations, number, size, height, number of storeys and character of buildings, and the density of the built up area allowed in a specified area, etc.

These guidelines also suggest percentages for land use under different categories in non-processing area and categorization of road hierarchy, including arterial roads, sub-arterial roads, collector streets and local streets.

Gujarat PCPIR – Development Guidelines[25]

- Minimum plot size for layout & subdivision of land for industrial uses shall be minimum 500 m^2.
- Margins to be provided for industrial plots: a) Plot of more than 500 m^2 and up to 1000 m^2 – road side margin of 6.0 m and on other sides margin of 3.0 m; b) Plot of more than 1000 m^2 and up to 2500 m^2 – road side margin of 6.0 m and on other sides margin of 4.5 m; c) Plots of 2500 m^2 to 5000 m^2 – road side margin of 7.5 m and on other sides margin of. 4.5 m; and d) Plots above 5000 m^2 – road side margin of 9 m and on other sides margin of 6 m.
- Requirement of road width: a) Road width of 12 m for road a length of up to 150 m; b) Road width of 15 m for a road length of 150 m to 300 m; c) Road width of 18 m for road length of 300 m and above. Curves for the roads should be: a) 4.5 m radius if the width of the road is 9 m or less; b) 6.0 m radius if the width of the roads is more than 9 m but not more than 18 m; c) 7.5 m radius if the width of the road exceeds 18 m.
- The length of a building shall not be more than 150.00 m in any case.
- No development whatsoever whether by filling or otherwise shall be carried out within 30 m from the boundary of the bank of the a river where there is no river embankment, and within 15 m such distance as may be prescribed under any other general or specific orders of Government and appropriate Authority whichever is more, from river where there is river embankment but in case of nala, canal, talav, lake, water-bodies etc. it shall be 9.00 m.
- Building unit having 1000 m^2 and above need to plant at least 3 trees for every 200 m^2 of the building; trees shall have to be shown on the site plan/layout plan and also has to be maintained the same.

Haryana

The Estate Management Procedures (EMP), 2011[26] of the Haryana State Industrial & Infrastructure Development Corporation Ltd. provides for:

- Primary level infrastructure: motorable roads for access to the site; water supply system; electrical infrastructure comprising of the distribution system network, sewerage system, and drainage system.
- Secondary level Infrastructure facilities: sewerage treatment/CETP[27]; security/ policing; convenience shopping facilities; idle parking spaces; green cover and parks; and solid waste disposal sites.
- Tertiary Level Facilities: communications/telecom services; post office; banking; provision for institutional sites; provision for financial market & insurance; research and development centres; skill development centres; conferencing & entertainment; exhibition & display facilities; cargo logistics centres/ custom-bonded warehousing; petrol & service stations; social infrastructure: industrial housing; healthcare & medical attendance services; dispensary/ hospital; schooling (if residential facilities are provided); organized transport linkages.

25 Gujarat Petroleum, Chemical & Petrochemical Special Investment Regional Development Authority.(n.d.). *General Development Control Regulations.* Retrieved from http://gujaratpcpir.org/pdf/general-development-control-regulations.pdf

26 Haryana State Industrial & Infrastructure Development Corporation. (2011). *Estate Management Procedures*

27 CETP stands for Common effluent treatment plant

Punjab

The guidelines for the development of Industrial Parks/Estates/Agro Parks/IT Parks, by private entrepreneurs/ agencies in the state of Punjab provide for:

- The minimum quantum of land for any such park shall be 10 acres. A minimum of 60% of the area will have to be developed as industrial pocket, a maximum of 30% of the area may be developed as a residential pocket, and 10% of the area can be developed as a commercial pocket. Government, in the Department of Industries may however, reduce the permissible limits for non-industrial use in particular cases.
- Permissible saleable area in the industrial pocket shall be 65%, in the residential pocket 60% and for the commercial pocket 40%. Balance of area shall be used for common facilities, open spaces, green belt etc., as per approved zoning plan and as per applicable byelaws.
- Floor Area Ratio (FAR) and ground coverage will be as per applicable byelaws/regulations in the area. The zoning and layout plan will be cleared by a competent authority, declared by Director of Industries & Commerce, Punjab.
- Common facilities would include the facilities for air conditioning, roads (including approach roads), water supply, sewerage facilities, common effluent treatment facilities, telecom networks, generation and distribution of power, provided that the facilities are used in more than 2 industrial units in the industrial park.
- The entrepreneurs shall have to first develop an industrial estate and at least 50% of industrial plots will have to be ready for possession before the commercial and housing facilities are allowed to be used/sold/allotted/ rented/ leased etc. The minimum number of units in the Park will be five.
- Infrastructure development would include roads (including approach roads) water supply and sewerage facilities, common effluent treatment facilities, telecom networks, generation and distribution of power, parking facilities, parks, street light and such other facilities as are of common use for industrial activities which are identifiable and are to be commonly used.
- Industrial Parks with a residential component shall have only non-polluting units. The distance between industrial area and other areas will be in accordance with guidelines issued by Punjab Pollution Control Board from time to time.
- As per the Guidelines for Planning Mega Projects, Punjab[28], the categorization of industrial parks on the basis of area is:
  - Category A: 750 acres of land and above
  - Category B: 500 acres of land and above
  - Category C: 250 acres of land and above

Tamil Nadu[29]

As per the Industrial Policy of the Government of Tamil Nadu (2007), the minimum area for an industrial park is 250 acres, with provision of 5 major manufacturing units and 50 SMEs[30]. The percentage distribution of land for various uses in an industrial park shall be:

- Processing area (industrial plots for manufacturing, ready built sheds for industrial use, R&D centres, testing & certification centres, pathways and roads): not less than 65% of the total area.
- Non-processing area: not more than 35% area.
- Business related non-processing area (office space for business support to processing area; customs bonded warehouses and ICD[31]s; convention centers; Business centres- financial services; education and skill training

28 Retrieved from http://puda.nic.in/img/uploads/NEW_formatted_Guidelines_of_Mega_Projects.pdf

29 Industries Department, Government of Tamil Nadu.(2007). *The Industrial Policy.* Retrieved from http://www.tidco.com/images/industrialpolicy_e_2007.pdf

30 SME stands for Small and medium Industries

31 ICD stands for Inland Container Depot

centres related to processing area; guest houses for use by businesses in processing area): not more than 20% of total area

- Social infrastructure (housing, schools, hospitals, general purpose education and training institutions, entertainment & shopping centres, open spaces, roads and pathways): not more than 15% of total area.

Delhi[32]

As per the Master Plan for Delhi – 2021, the percentage distribution of land for various uses in industrial parks is given below:

Table no. 2-9: Percentage distribution of land uses in Industrial Park

S. No.	Land Use	Percentage
1	**Industrial plots** (net area)	55-60
2	**Recreational** Buffer zones, Parks, Water bodies, Green under high tension lines etc.	10-12
3	**Commercial** Shopping Centre, Petrol Pumps, Guest House/ Budget Hotels, Lodging and Boarding, Service and Repair shops, Communication / Telephone Exchange etc.	2-3
4	**Facilities** Public and semi – public: Fire Station/ Fire Post, Police Station / Police Post, Hospital / Dispensary, Day Care Centre Etc. Utilities: Electric Sub-Station, CETPs, Pumping station, Underground Reservoir / Fire Fighting tanks and other utilities etc.	8-10
5	**Transportation** Circulation, Loading/Unloading Area, Parking, ideal truck Parking, Goods Vehicle parking etc.	18-20
		100

32 Delhi Development Authority. (2010). *Master Plan for Delhi – 2021.* New Delhi, India; Retrieved from https://dda.org.in/ddanew/pdf/Planning/reprint%20mpd2021.pdf

Chapter 03
Re-Planning of GIP Jadcherla

The common infrastructure and services to be provided at the central and zonal level of GIP Jadcherla are:

- ***Basic*** Infrastructure
- ***Technical*** Infrastructure
- ***Environmental*** Infrastructure
- ***Social and Functional*** Infrastructure

Details are given below.

A. Basic Infrastructure

Industrial Zones

The earlier Site Master Plan of GIP Jadcherla (Refer map no. 1-1) did not distinctly zone the industrial park for various industries. To provide for common infrastructure and facilities for the revised Site Master Plan the industrial park has now been divided into the following zones (Refer table no. 3-1):

Table no. 3-1: Zone-wise area

S. No.	Zone	Area (in m^2)	Area (in acres)
1	Special economic zone (SEZ)	974019	240.60
2	General engineering zone	857554	211.91
3	Micro, medium and small enterprises (MSME) Zone	266942	65.95
4	Green industry zone	166750	41.21
5	Women entrepreneur industry zone	230428	55.94
6	Commercial zone	134336	33.20
7	University zone	361975	89.43
8- (a) and (b)	Rehabilitation zone	129106	31.90

Source: Estimated by GIZ- IGEP

This was done based on homogeneity homogeny in the nature of industries as well as keeping transition zones in mind. (Refer Annex II: map no.3-1). The university zone has been left out as there will be a separate site master plan for this area, which will have to be prepared by the university authorities.

Permissible Industries:

The allowed types of industries in the above zones are mentioned below (Refer Annex I: 3-1):

Table no. 3-2: Zone-wise permissible industries

Industrial zone	Allowed industries
Zone 1: Special economic zone (SEZ)	> Pharmaceutical formulations will be allowed. > The industrial waste water, including domestic waste water from canteens, floor > washing, etc. should not exceed 20 KLD[33]. > Industries should not generate any atmospheric emissions from processes or operations expect from DG[34] sets. > Industries should not generate any types of hazardous wastes. > Industries should not be involved in handling any types of toxic or hazardous chemicals.
Zone 2: General engineering zone	> Engineering industries including fabrications units, general engineering works, etc. > The industrial waste water, including domestic waste water from canteens, floor washing, etc. should not exceed 20 KLD. > Industries should not generate any atmospheric emissions from processes or operations expect from DG sets. > Industries should not generate any types of hazardous wastes. > Industries should not be involved in handling any types of toxic or hazardous chemicals.
Zone 3: Micro, medium and small enterprises (MSME) zone	> Green category industries of MSME scale should be considered if possible. > The industrial waste water, including domestic waste water from canteens, floor washing, etc. should not exceed 20 KLD. > Industries should not generate any atmospheric emissions from processes or operations expect from DG sets. > Industries should not generate any types of hazardous wastes. > Industries should not be involved in handling any types of toxic or hazardous chemicals.
Zone 4: Green industry zone	> Industries should not generate any industrial waste water (except domestic wastewater from canteens, floor washing, etc. which should not exceed 20 KLD). > Industries should not generate any atmospheric emissions with any pollutants including noise and vibration. > Industries should not generate any types of hazardous wastes. > Industries should not be involved in handling any types of toxic or hazardous chemicals.
Zone 5: Women entrepreneurs industry zone	> The zone will have industries owned by women entrepreneurs. The conditions for allowing industries will be same as in MSME Zone.
Zone 6: Commercial zone	> Commercial activities including warehouses, a business centre, a shopping complex, a petrol pump, etc.
Zone 7: University zone	> University activities.
Zone 8 (a) and (b): Rehabilitation zone	> Residential township.

33 KLD stands for Kilo litres per day

34 DG stands for Diesel Generator

Restricted Industries:

Industry processes or operations that are likely to cause pollution or any adverse impact on the environment will not be allowed in GIP Jadcherla. (Refer Annex I: 3-2).

Any industry involved in the following industrial operations or processes will not be allowed in GIP Jadcherla:

- Dust or odors from handling of materials, industrial processes or operations that are detrimental to human health and the environment
- Any pollutant emissions or toxic emissions from production processes, storage/ handling and transportation of materials, emissions from combustion of fossil fuels in boilers or heaters, etc., emissions from incineration of waste etc.
- Any storage of hazardous goods or materials.
- Generation of noise and vibration, emissions of light and heat that are detrimental to human health and the environment.
- Generation of hazardous wastes (as per Hazardous Waste Management Rules[35]).
- Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters or groundwater from:
  - Handling, storage, use, or spillage of hazardous materials;
  - Discharge of sewage or other effluents to water or the land (expected mode and place of discharge);
  - Deposition of pollutants emitted to air into the land or into water; and
  - Any other sources.
- Risk of accidents during construction or operation of the project, which could affect human health or the environment, like:
  - From explosions, spillages, fires, etc.;
  - From storage, handling, use, or production of hazardous substances; and
  - From any other causes.
- Storage and handling of chemicals, hazardous materials, and inflammable materials.
- Underground works including mining or tunneling.
- Use of substances or materials, which are hazardous (as per MSIHC rules[36]) to human health or the environment.

Plot Sizes

GIP Jadcherla has flexible plot/block sizes. Certain plots in general engineering zone, special economic zone, MSME zone were already planned and allotted by TSIIC (then APIIC) to industries. They were not changed while replanning. The plot sizes available under various zones in the GIP Jadcherla are given below:

35 Government of India. (2008). *Hazardous Wastes (Management, Handling and Transboundary Movement) Rules.* Retrieved from http://www.cpcb.nic.in/divisionsofheadoffice/hwmd/mhtrules2008.pdf

36 Ministry of Environment and Forests, Government of India. (1989). *Manufacture, Storage and Import of Hazardous Chemicals (MSIHC rules).* Retrieved from http://www.cpcb.nic.in/upload/Publications/%2828%29HAZARDOUS%20CHEMICALS%20RULES.doc

Table no. 3-3: Different categories of plots in the park

Industrial zone	Plot sizes available
General Engineering Zone	> Up to 1000 m^2 - 10 plots, > 1,000 to 5,000 m^2 - 19 plots, > 5,000 to 10,000 m^2 - 22 plots, > 10,000 m^2 to 15,000 m^2 - 12 plots, > 15,000 m^2 to 20,000 m^2 - 5 plots, > Above 20,000 m^2 - 11 plots
Special Economic Zone (SEZ)	> Upto 5,000 m^2 - 3 plots, > 5,000 to 10,000 m^2 - 17 plots > 10,000 to 15,000 m^2 - 3 plots > Above 15,000 m^2 - 4 plots
Micro, Medium, and Small Enterprises (MSME) Zone	> Up to 1,000 m^2 - 156 plots, > 1,000 to 5,000 m^2- 9 plots
Green Industry Zone	(Layout to be determined)
Women Entrepreneurs Industry Zone	(Layout to be determined)
Commercial Zone	> Approx. 20,000 m^2 - 7 plots

Source: Estimated by GIZ-IGEP

The conditions[37] to be followed by the plot holders are given below:

- The length of a building shall not be more than 150 m in any case.
- No development whatsoever (filling or otherwise) shall be carried out within 30 m from the boundary of the bank of the river
- Where there is no river embankment, no development whatsoever (filling or otherwise) shall be carried out, within 15 m, as may be prescribed under any other general or specific orders of Government and appropriate authority,
- In case of nala, canal, talav[38], lake, water-bodies etc. No development whatsoever (filling or otherwise) shall be carried out within 9.00 m from the boundary of such water body.
- Building unit of area 1000 m^2 and more shall undertake the planting of trees at the rate of 3 trees for every 200 m^2 of building unit.
- FAR and ground coverage will be as per applicable byelaws/regulations in the area.
- Water bodies: No building / development activity shall be allowed in the bed of water bodies like river or nala and in the Full Tank Level (FTL) of any lake, pond, cheruvu, or kunta/shikam lands. The water bodies and courses shall be maintained as recreational/green buffer zones and no building activity shall be carried out within:
  - 100 m from the boundary of the River outside the Municipal Corporation / Municipality / Nagara Panchayat[39] limits and 50m with in the Municipal Corporation / Municipality / Nagara Panchayat limits. The boundary of the river shall be as fixed and certified by the Irrigation Department and Revenue Department.

37 Conditions are the set of rules to be followed by plot holders as per Andhra Pradesh Building Rules, 2012, Government order no. 168

38 Talav is a Hindi word which refers to pond

39 Nagara Panchayat is a Hindi word which means Notified Area Council

- 30 m from the FTL boundary of Lakes Tanks/Kuntas of area 10 Ha and above.
- 9 m from the FTL boundary of Lakes/Tanks/Kuntas of area less than 10 Ha / shikam lands;
- 9 m from the defined boundary of canals, vagu[40], nala, storm water drains of width more than 10 m.
- 2 m from the defined boundary of canals, vagu, nala, storm water drains of width up to 10 m.

- In case of electricity tower lines, the land below the power line shall be developed as a green belt to an extent of the width of the tower base and on either side of the green belt there shall be a minimum of 10m wide roads or as defined in the Site Master Plan.
- In the case of sites in the vicinity of high tension electricity transmission lines, besides taking other safety precautions, a minimum safety distance (both vertical and horizontal) of 3 m (advisable distance 20 m wherever feasible) shall be maintained between the building and the high tension electricity lines and 1.5 m shall be maintained between the building and the low tension electricity lines.

Road Network

The earlier Site Master Plan of GIP Jadcherla (Refer map no. 1-1) did not did not have standardized road cross sections. The revised Master Plan has provided for road hierarchy as below:

Level 1: 45 m R-O-W
(3+3 Motorized vehicle lanes, median, pedestrian path, bicycle track, avenue plantation and utility including water supply, electrical lines zone)

↓

Level 2: 36 m R-O-W
(2+2 Motorized vehicle lanes, median, pedestrian path, bicycle track, avenue plantation and utility including water supply, electrical lines zone)

↓

Level 3: 24 m R-O-W
(1+1 Motorized vehicle lanes, sidewalk, avenue plantation, bicycle track and utility including water supply, electrical lines zone)

This hierarchy is followed by 20 m, 15.3 m, 15 m, 12 m and 6 m roads. (Refer image no. 3-1, 3-2, 3-3, 3-4, 3-5)

Certain guidelines and examples that were referred to are mentioned below:

- As per PCPIR: Roads may be categorized as follows:
  - Main entrance or approach road - width not less than 30 m;
  - Trunk roads - width not less than 20 m; and
  - Tertiary roads - width not less than 12 m.
- As per the Gujarat PCPIR, requirement of road width are:
  - Road width of 12 m for road length up to 150 m;
  - Road width of 15 m for road length of 150 m to 300 m;
  - Road width of 18 m for road length of 300 m and above.
- Curves for the roads should be:
  - 4.5 m radius if the width of the road is 9 m or less;
  - 6.0 m radius if the width of the roads is more than 9 m but not more than 18 m;
  - 7.5 m radius if the width of the road exceeds 18 m.

40 Vagu is a telugu word which means hill stream

- As per the state norms[41]:
  - Minimum width of proposed roads in the layout shall be 10 m for residential and 12 m for all non-residential layouts. Notwithstanding the above minimum width, the Executive Authority may insist upon larger road widths depending upon local conditions or importance of any particular road etc. The width of the roads in the layouts shall be in conformity with the General Town Planning Scheme or the Indicative Land Use Plan or Master Plan, if any in force.
  - Road and Cul-De-Sacs: 9 m to 18 m for main internal approach roads; 9 m for other internal roads and also for looped roads; and 8 m for cul-de-sac roads (with a minimum radius 9m) between 50-100 m in length.
- The recommended cross sections as per URDPFI[42] Guidelines (Refer Annex. 3-9).

However, above standards for road cross sections were further modified to accommodate for storm water drains, sewerage, street lights, electric, data cables, etc. Following were the basic parameters followed to design road cross sections:

- Due to partially built nature of GIP Jadcherla with already 75% allotments; provision of additional service lanes was considered difficult. Hence, only the components within the road cross sections were standardized.
- For storm water management, watershed analysis was done to arrive at the appropriate drain width on each section of the road. (Refer image 3-25). Therefore, following road sections should be followed for respective road hierarchies at GIP Jadcherla:
- Differential width on each road cross section gave way to 2 cross sections each for 45 m, 36 m, 24 m and 15.3 m roads. For sake of convenient implementation, a key map was generated. (Refer Map no. 3-1).
- All the road cross sections illustrative for the purpose of showing components of road.
- Width of the carriage way is 9 m (one way) for 45 m road and all other hierarchy will have 7 m /3.5 m (one way) to avoid bottlenecks
- All the levels in the road cross sections should be determined based on detailed engineering drawings.
- The sections of all drains are only descriptive, detail studies should be done to determine the slopes, depths etc. for construction work.

41 Governemt of Andhra Pradesh. (2002). *The Andhra Pradesh Gram Panchayat Land Development (Layout and building) Rules – 2002 – Government order no. 67.*

42 Ministry of Urban Development, Government of India.(2015). *Urban and Regional Development Plans Formulation and Implementation Guidelines.* New Delhi, India.

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 , 418 TO 435, 437 TO 445, 452 TO 459 OF POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RAJAPUR VILLAGE , BALANAGAR MANDAL, MAHABOOBNAGAR DISTRICT

NOTE:15.3 M. ROADS HAVE THREE TYPES OF ROAD CROSS SECTIONS DEPENDING UPON CONTEXT

KEY TO ROAD CROSS SECTIONS

LEGEND

- SITE BOUNDARY
- A-A': 45 M ROAD (1.5 M WIDE STORM WATER DRAIN)
- B-B': 45 M ROAD (1.0 M WIDE STORM WATER DRAIN)
- C-C': 36 M ROAD (1 M WIDE STORM WATER DRAIN)
- D-D': 36 M ROAD (0.75 M WIDE STORM WATER DRAIN)
- E-E': 24 M ROAD (1 M WIDE STORM WATER DRAIN)
- F-F': 24 M ROAD (0.75 M WIDE STORM WATER DRAIN)
- G-G': 15.3 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- H-H': 15.3 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- I-I': 15.3 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- J-J': 15.3 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- K-K': 15 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- L-L': 12 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- M-M': 6 M ROAD (0.5 M WIDE STORM WATER DRAIN)

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

R.F 1:20000

SCALE 100 0 100 200 300 400 500 (in metres)

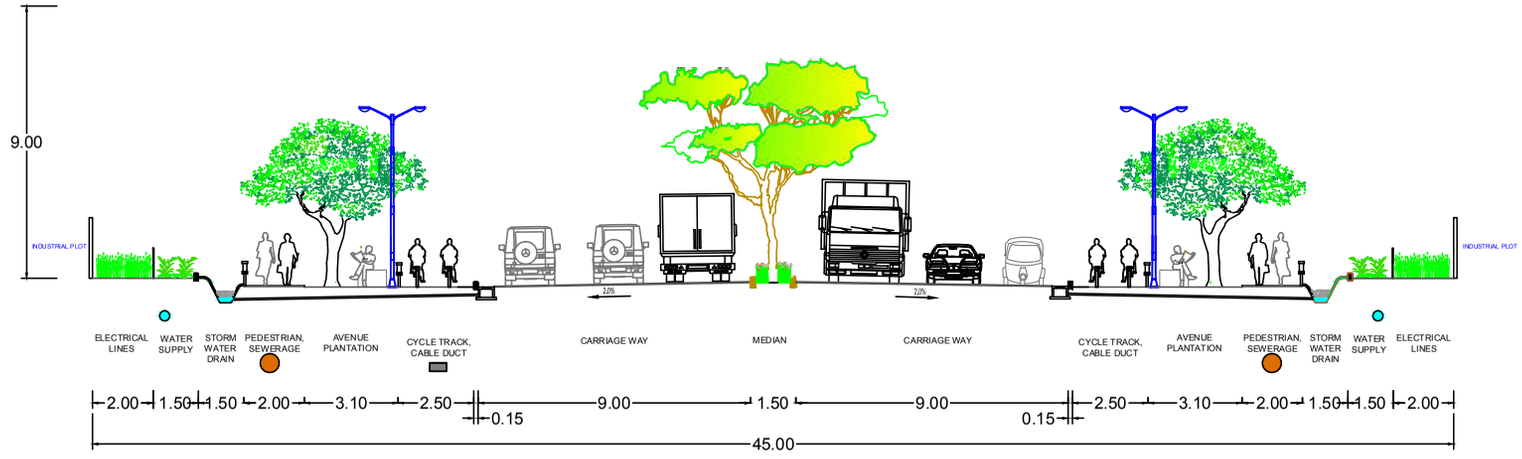
N

DRAWING NO.	SHEET SIZE	DATE OF PREPARATION	DATE OF REVISION
3-6	A4		

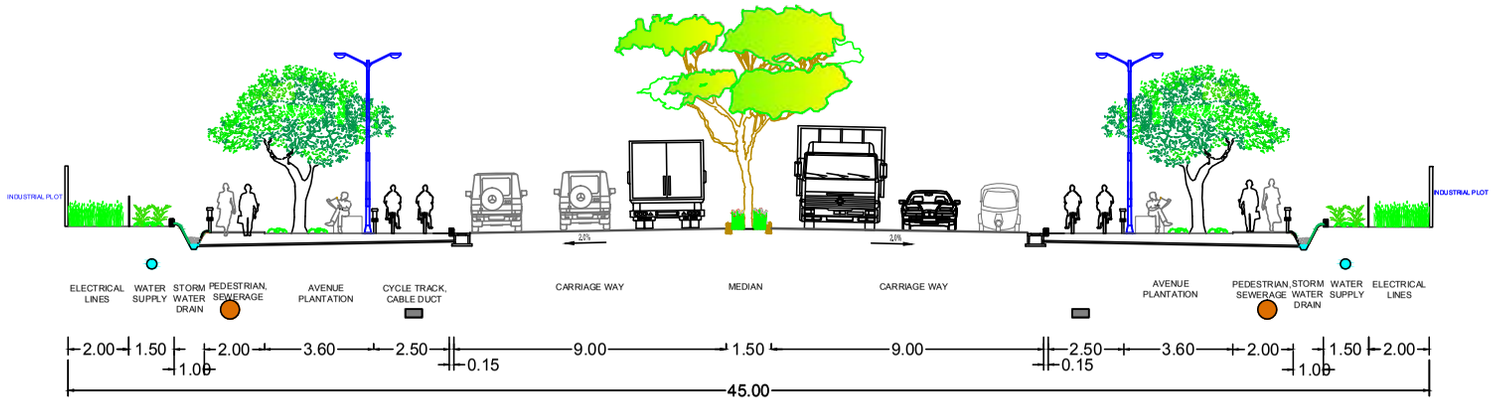
DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY

Map no. 3-1: Key to the road cross sections

[Source: GIZ-IGEP]



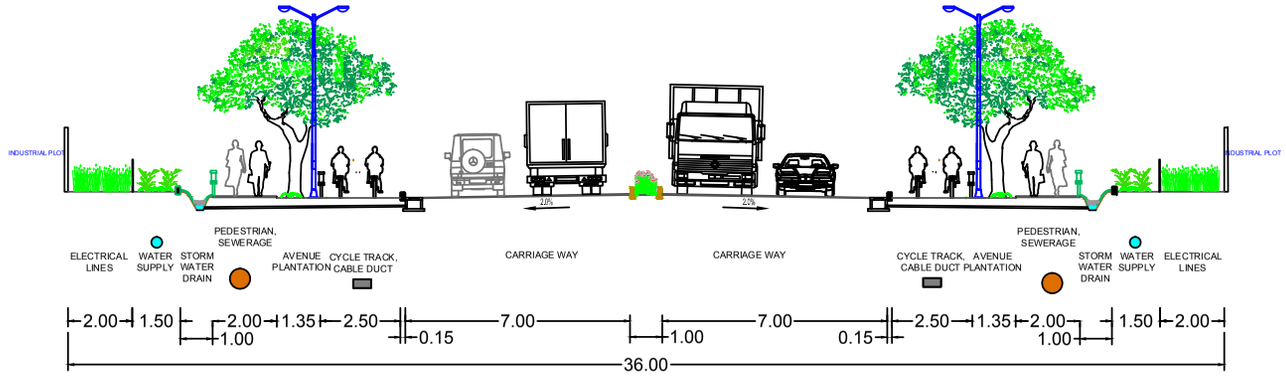
A- A' : 45 M. R.O.W. (WITH 1.5 M STORM WATER DRAIN)



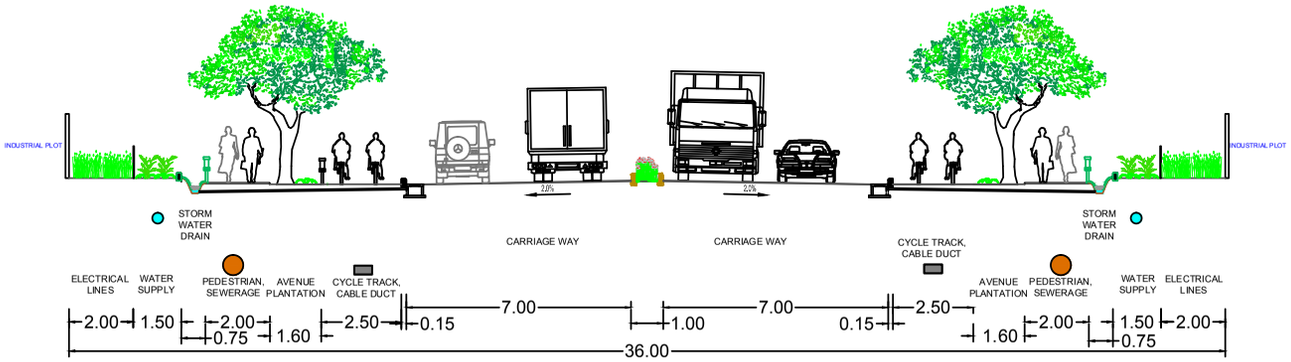
B- B' : 45 M. R.O.W. (WITH 1.0 M STORM WATER DRAIN)

Image no. 3-1.: Standard road cross sections for right-of-way 45 m

[Source: GIZ-IGEP]



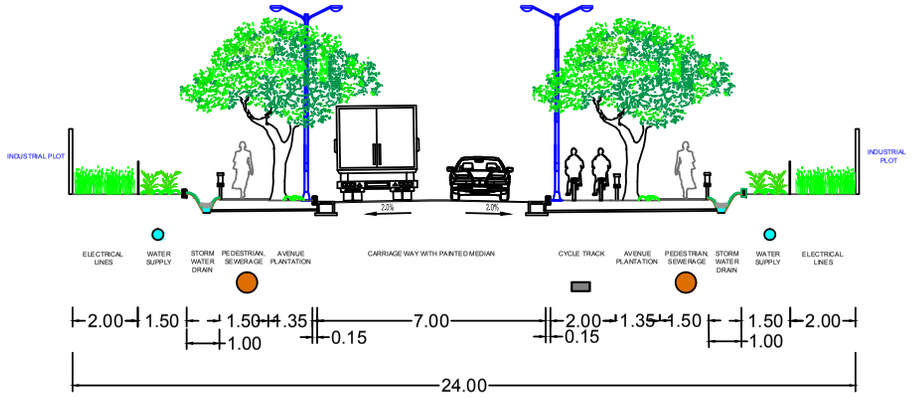
C- C' : 36 M. R.O.W. (WITH 1.0 M STORM WATER DRAIN)



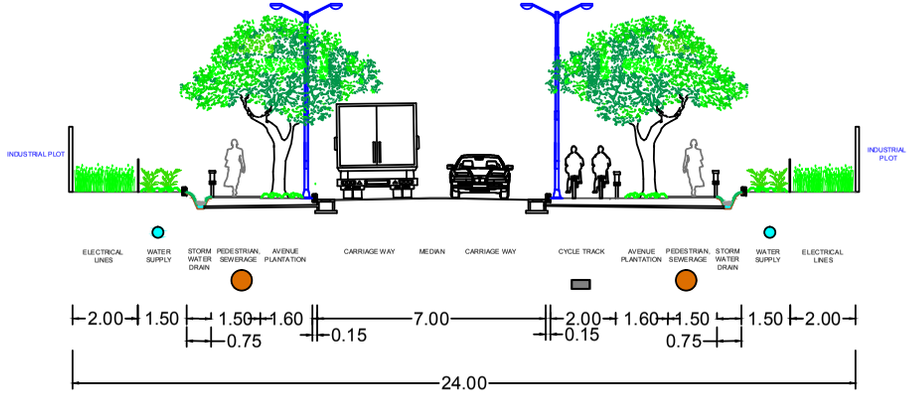
D- D' : 36 M. R.O.W. (WITH 0.75 M STORM WATER DRAIN)

Image no. 3-2.: Standard road cross sections for right-of-way 36 m

[Source: GIZ-IGEP]

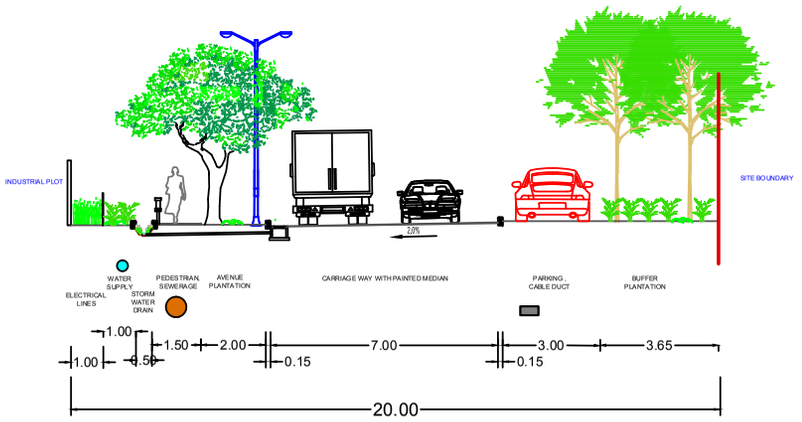


E- E' : 24 M. R.O.W. (WITH 1.00 M STORM WATER DRAIN)

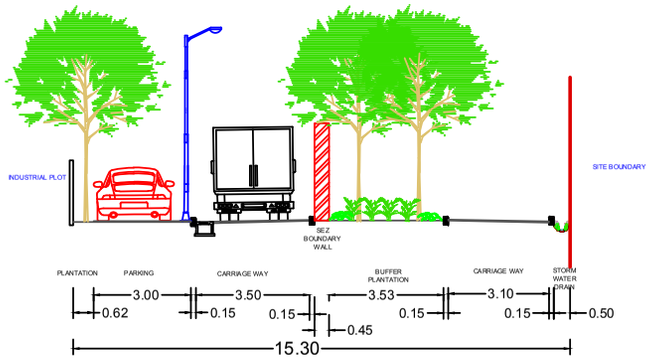


F- F' : 24 M. R.O.W. (WITH 0.75 M STORM WATER DRAIN)

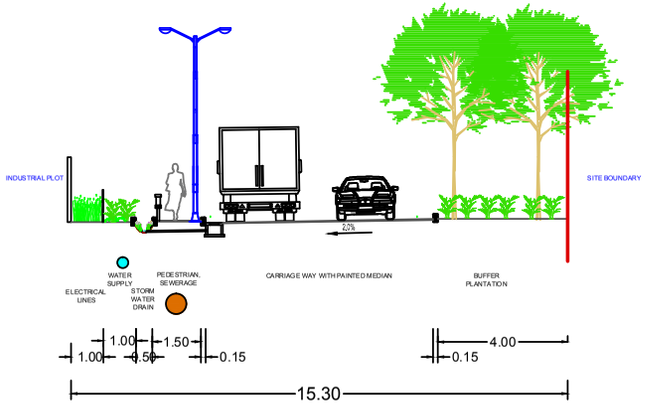
Image no. 3-3.: Standard road cross sections for right-of-way 24 m
[Source: GIZ-IGEP]



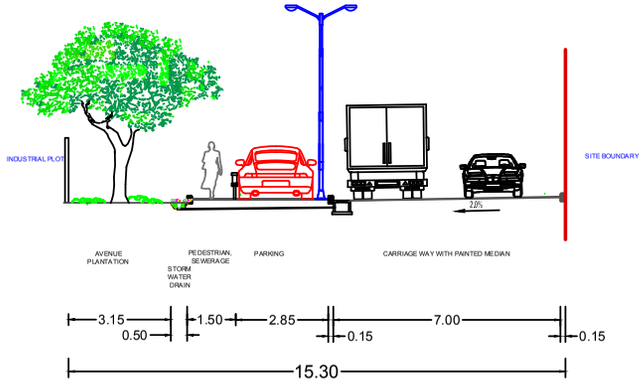
G- G' : 20 M. R.O.W.



I- I' : 15.3 M. R.O.W.



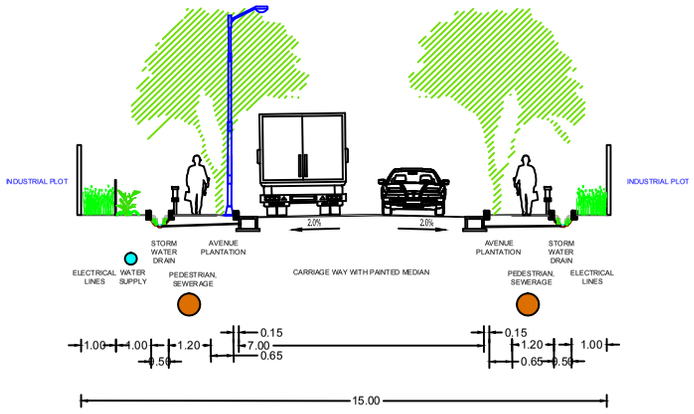
H- H' :15.3 M. R.O.W.



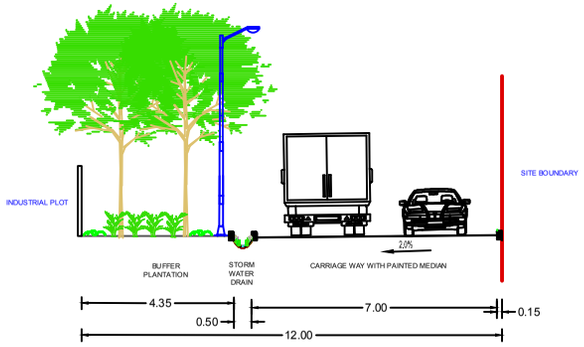
J- J' :15.3 M. R.O.W.

Image no. 3-4.: Standard road cross sections for right-of-way 20,m 15.3 m

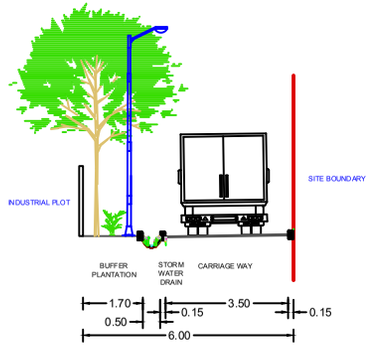
[Source: GIZ-IGEP]



K- K' :15 M. R.O.W.



L- L' :12 M. R.O.W.



M- M' : 6 M. R.O.W.

Image no. 3-5.: Standard road cross sections for right-of-way 15 m, 12 m, 6 m

[Source: GIZ-IGEP]

Services

The services like water supply line, sewers etc. in the road cross sections are indicated for their relative placement. Actual depth of the laying services should be referred from the table below:

Table no. 3-4: Underground utility depths

S. No.	Type of utility	Depth (m)
1	Trunk sewer line	2.0 - 6.0
2	Water supply	1.0 - 1.5
i	Service line	0.6 - 1.0
ii	Trunk line	1.0 - 1.5
3	Electric cable	1.0 - 1.5
i	LT cable	0.6 - 1.0
ii	HT cable	1.5 - 2.0
4	Telecommunications cable	2.0 - 3.0
i	Directly laid	0.6 - 1.0
ii	Laid in ducts	2.0 - 3.0
5	Gas mains and lines carrying combustible materials	2.0 - 3.0

Source: Ministry of Urban Development, Government of India. (2015). *Urban and Regional Development Plans Formulation and Implementation Guidelines.* New Delhi, India.

Entry/Exit Provisions

The main entry gate will have signature architecture to reflect the unique identity of the green industrial park and will integrate local architectural elements. The entry gate will have provisions for CCTV[43], access control to monitor and control movement of vehicles through the industrial park. (Refer Annex II: map no. 3-3)

The entry gate could be manned through the Industrial Area Local Authority (IALA) of GIP Jadcherla or services could be put in place through appropriate business models (e.g. Public Private Partnership). An entry fee could be charged, which could be used for maintaining parking facilities and other road infrastructure.

Image no. 3-6: Proposed view of main entrance gate GIP, Jadcherla

[Source: Image created by GIZ-IGEP team]

43 CCTV stands for Closed-circuit television

Image no. 3-7: Proposed view of access control and display of GIP map

[Source: Image created by GIZ-IGEP team]

The main entrance will also have the following:

- Iconic entrance gate (Refer image no. 3-6);
- Security cabin;
- Information centre;
- GIP map & posters to showcase how individual tenants/workers could contribute towards making it a truly Green Industrial Park. (Refer image no. 3-7);
- Parking facility - to provide for adequate parking/standing of trucks to avoid queuing at the entry/exit and to provide parking for those who want to use bicycles or battery operated vehicles;
- Bus stop for external transport;
- Bus stop and parking for internal transport;
- Adequate front space (in front of gate) for landscaping and design elements;
- Public toilets; and
- Drinking water facility.

There is also a second entry point for workers/employees on the western side of the Industrial Park. This gate has provisions for:

- Security cabin;
- GIP map & posters to showcase how individual tenants/workers could contribute towards making it a truly Green Industrial Park;
- Parking facility - to provide parking for those who want to use bicycles or battery operated vehicles;
- Bus stop for external transport;
- Bus stop and parking for internal transport;
- Adequate front space (in front of gate) for landscaping and design;
- Public toilets; and
- Drinking water facility.

Mobility - Eco Efficient Transportation

Eco-efficient transportation provided for the Site Master Plan of GIP Jadcherla includes appropriate road hierarchy, mobility of goods and passengers (internal and external transportation), parking, pedestrian pathways, bicycle ways, truck parking together with a service station, toilets, a rest house, cooking areas, and canteen for drivers.

a) External Linkages

- It is suggested that APIIC should encourage the State Government or its agencies to improve/provide external road linkages between the GIP Jadcherla, nearby settlements or housing areas from where workers/ employees will travel to, the railway station, bus station, etc. (Refer image no. 3-8)
- Bus stops and pedestrian access points have been allocated near the main entrance of GIP for providing easy access to regional bus service.
- GIP management should arrange for eco-friendly public transportation such as battery operated vehicles, CNG buses to operate from GIP to the nearby settlement, housing areas, railway station, bus station etc. (Refer image no 3-8). The services could be put in place through appropriate business model (e.g., PPP).
- Public transportation like a battery operated shuttle bus has been proposed to establish an eco-friendly link between the surrounding villages and the railway station at Gollapally to the GIP.
- A foot bridge crossing the highway has been proposed for providing quick and safe access for the pedestrian workers and visitors to the GIP.
- A bike and pedestrian network should be created between the surrounding settlements and the GIP as well as within the GIP for workers.

Image no. 3-8: External linkages for GIP Jadcherla

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b) Internal mobility

- Battery operated vehicles should be provided for internal transport for employees/workers/visitors. The services could be put in place through appropriate business model (e.g. PPP).
- Bus stops/shelters are to be provided in the Site Master Plan of the GIP.
- Bicycle ways and spaces for bicycle stations are to be provided in the Site Master Plan of GIP. The services could be put in place through appropriate business models (e.g. PPP).
- For private vehicles, adequate parking facilities have been provided at the entry/exit points, at central level, and at zonal level. Plot level parking has to be provided by the industries (plot holders).

Bicycles Ways

- Bicycle tracks, bicycle stations, and bicycle parking facilities (Refer image no. 3-9) have been provided in the Site Master Plan of the GIP to encourage the usage of bicycles for getting to work. (Refer Annex II: map no. 3-4) Facilities to rent bicycles, parking places at every facility zone, and dedicated cycle tracks on 3 major hierarchical roads i.e. 45, 36 and 24 m are provided for in the Site Master Plan of the GIP. The services could be put in place through appropriate business models (e.g. PPP).

Image no. 3-9: Example of sheltered bi-cycle parking

[Source: Seattle bicycle master plan. (2013). *Sheltered bi-cycle parking.* Retrieved from http://www.seattle.gov/transportation/docs/bmp/2013/BMP%20lunch%20and%20learn_june.pdf]

Pedestrian Network

The GIP Jadcherla will have an extensive pedestrian network consisting of sidewalks along roads and green pathways to create a system of safe and convenient pedestrian ways throughout GIP Jadcherla. (Refer Annex II- map no. 3-4)

All the sidewalks should be shaded and continuous. Green pathways are proposed to reach to the facility zones/ industrial zones to avoid conflicts in movement of vehicles. Provisions for kiosks (for refreshments etc.) drinking water points, etc. have been provided along with the green pathways. The green pathways provided in the *MSME Zone, Green Industries* Zone, and *Women Industries Zone* would give a natural, attractive and safe option of travel. (Refer Annex II- map. no 3-7)

The width of secondary greens between the plots is given in a manner to provide for a loop of pedestrian and cycling along the streets and through the green pathways behind plots.

Image no. 3-10 Example of green pathway through the row of industrial plots

[Source: Murty & Manyam Architects and Engineers Ltd.]

Parking at the GIP Jadcherla

Parking of trucks is one of the most important functions in operational efficiency of the industrial park. Planning for parking sites has been done based on hierarchy, purpose, safety accessibility and space standard (Refer Annex I: 3-4). To avoid truck parking on-street in a haphazard manner, parking should be provided at: a) park level (overnight stay), b) zone/cluster level (temporary stay), and c) plot level (loading/unloading). The relationship between parking and their locations can be found below:

Centralised truck parking	• For long haul trucks
Zone level truck Parking	• For trucks waiting to reach an individual plot within the zone
Plot level truck parking	• For loading /unloading activity within the park

Centralized Truck Parking at GIP Jadcherla

For design calculations, the following considerations have been taken:

- Only loaded trucks (with raw materials) and empty trucks (for finished goods) coming to the SEZ will be allowed to use this parking area. The average parking duration for the trucks will be 8 hours.
- 30% of the total daily trucks will enter in a particular slot over 8 hours, including the peak hour.

The parking requirement for long halt trucks has been worked out for every zone and added up for the central level facility, as shown below:

Table no. 3-5: Parking requirements for centralized truck parking

S.No.	Zone	Plottable area (acres)	Input tonnage per acre per day[44]	Output tonnage per acre per day	Total flow in tonnage per day	Total trucks per day[45]
1	General engineering zone	181	11	4	719	170
2	SEZ	202	25	25	10088	630
3	MSME zone	42	6	3	380	24
4	Green industry zone	33	11	4	493	31
5	Women entrepreneur's industry zone	42	11	4	630	39
	Total					**894**

Source: Estimated by GIZ- IGEP

- Carrying capacity of 1 truck = 16 tonnes (16000 kg)
- Parking provision for 30% of trucks over a period of 8 hours = 268
- Area required per truck (including maneuvering) = 64 m^2
- Idle parking area at centralized facility zone = 17,100 m^2

Truck parking in the central facility zone has been provided based on the basic conceptual design of parking at a 90 degree angle (Refer Annex I: 3-3, 3-4). It should be noted that the parking layout might be modified depending on the locational setting, shape of site, etc.

Zone Level Truck Parking

The following assumptions have been made to provide for parking spaces at zone level:

- Parking at zonal level shall be only for transit purpose i.e. for trucks and idle parking for workers.
- For every shift, 50% of the zone wise parking has been provided in common facility to avoid parking on roads.

Area required for truck (including maneuvering) parking for 30% trucks over a period of 8 hours:

- Zone 1: 349 m^2
- Zone 2: 12,054 m^2
- Zone 3: 454 m^2
- Zone 4: 589 m^2
- Zone 5: 753 m^2

The identified components at the parking facility at zonal level are (Refer Annex I: 3-5):

- Parking space
- Toilets/Wash rooms
- Restaurant and retail shops
- Space for maintenance staff
- Weigh station

44 Tonnage of respective industries has been referred from URDPFI

45 Number of trucks has been calculated as per capacity of each truck (Refer Annex I:3-4)

Truck Parking at Entry/Exit Zones

There are two entry/exit zones defined for the GIP Jadcherla; of them the main entry is from the road abutting the eastern edge of the site and the secondary entry is from western road. Parking at the entrance is only for short time purposes, until trucks can move to the central parking facility of zonal level parking. Hence, space has been provided for 10% of parking requirements at the central parking facility.

Table no. 3-5: Parking requirement at entry/exit

S.No.	Description	Requirement
1	No. of trucks	27
2	Area per truck	64 m^2
3	Parking to be provided	1,710 m^2

Source: Estimated by GIZ- IGEP

Prevention of Oil Spillage

There will be a lot of trucks for shorter and longer periods, so we recommend to consider an easy to implement but highly successful system of oil spill reduction. Once parked, a plastic container should be placed underneath the engine to collect spilled engine oil (Refer image no 3-7)

Image no. 3-11: Example of oil spill collection of trucks

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Car Parking at Zone Level

For passenger cars and motorbikes, adequate parking areas are provided for: a) overnight stay (of cars and motorbikes), b) parking close to individual plots (cars and two wheelers of employees), and c) at individual plots (temporary parking for visitors). For the vehicles of workers, every zone will have a dedicated parking lot.

Space will be designated for parking at the plot level as well. Hence, out of the total parking needs, it is considered that 50% of the parking required for visitors, employees, and service people will be provided at the individual plot. Adequate truck parking has to be provided at the plot level by industries as well; hence it is assumed that only 10% of the truck traffic and passenger traffic shall be provided space at zonal parking facilities. It is envisioned that 40% of the industrial workers will be commuting by buses. Hence, their parking spaces have been calculated at the individual zone level. Overall modal split of traffic shall be as listed below:

Table no. 3-6: Modal split of total traffic

S. No.	Modal split	Percentage distribution of total traffic (Employees +Service +Visitors)
1	Cars	10%
2	2W (Motorcycle)	20%
3	2W (Bicycle)	20%
4	Carpool Vehicle / preferred parking for women (4W/ 3W)	10%
5	Bus	40%
	TOTAL	100%

Source: Estimated by GIZ- IGEP

Parking requirements of employees, service providers, as well as visitors have been proposed at zone level. The space requirements have been calculated as below:

Table no. 3-7: Zone-wise modal split and area requirements (m^2)

S. No.	Line of activity	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	Cars	2,185	1,054	2,381	1,560	1,260
2	2W (Motorcycle)	2,185	1,054	2,381	1,560	1,260
3	2W (Bicycle)	655	316	714	468	1,260
4	Carpool Vehicle / preferred parking for women (4W/ 3W)	546	263	595	390	315
5	Bus	317	153	345	226	183
	TOTAL	**5,887**	**2,840**	**6,417**	**4,204**	**4,278**

Source: Estimated by GIZ- IGEP

A sample car parking design has been shown (Refer Annex I: 3-6); similarly parking design of all categories of vehicles can be prepared.

Bus Bays

Along the collector road and close to the zonal facilities, bus bays should be provided to integrate mobility and infrastructure. As per the Indian Road Congress (IRC) codes 86-1983,

- Bus bays should be located 75 m from the intersection on either side.
- Bus bays should be provided by recessing the curb to avoid conflict with moving traffic.
- The length of the recess should be 15 m for a single bus stop.
- The taper should be desirably 1:8 (m).
- The depth of the recess should be 4.5 m for single bus stop.
- A minimum 1.5 m footpath should be ensured behind the bus bays.

The area requirements for bus bays are given below:

Table no. 3-8: Area requirements for bus bays

S.No.	Location	Area (m^2)
1	At main entrance	67.5
2	At entrance of western periphery	67.5
3	Central facility area, zone-1, 2, 3, 4, 5 (both sides of road)	135

Source: Estimated by GIZ- IGEP

Automobile service station

To serve the industrial park efficiently, 2 service stations/workshops have been provided - one at the central facility zone and the other at the entrance zone. (Refer Annex I: 3-7).

Total area required for 2 service centres = 4290 m^2 ~ 4300 m^2

Weigh bridge/station

To serve the industrial park, 2 weigh bridges/stations are to be provided. A weigh bridge/station with dimensions 18 m x 3 m is proposed so that it can cater upto multi-axle vehicles. The area requirements are shown in the table below:

Table no. 3-9: Area requirements for weigh bridge/station

S.No.	Location	Area (m^2)
1	Weigh bridges/Station at zone 1	150
2	Weigh bridges/Station at zone 2, 4, 5 (to be provided at central facility zone)	300
3	Weigh bridges/Station at zone 3	Already in an allotted plot
4	Total area required for 2 service centres (m^2)	450

Source: Estimated by GIZ- IGEP

Signage

The following system of signage has been envisaged:

- Directional signage along major roads, pedestrian ways, and bicycle ways;
- Signage on landmarks, central facilities, zonal facilities etc.;
- Signage pertaining to names of industries should be uniform (Refer image no. 3-12);
- Information signage; and
- Advertisement boards/hoardings.

Signage should be integrated with road cross sections and landscaping features. A uniform system of colour, placing, and text should be followed to avoid confusion. Advertisement boards and hoardings should be located suitably, integrating with the landscaping.

Image no 3-12.: Example of signage at industry
[Source: Murty & Manyam Architects and Engineers Ltd.]

Fire, Safety and Security

Security

A centralized security office is proposed at the main entrance of the GIP. In addition, a security cabin is to be provided at the entry and exit points.

- Dimensions of security cabin = 2.4 m X 2.4 m
- Area of security cabin at main entrance = 5.76 m^2

Fencing

The industrial park is proposed to have fencing all around. The fencing should be made of environmentally-friendly materials and should have an elegant design (Refer image no. 3-13). Provisions have been made for a buffer zone (with varying width between 2-4 m) and a road along the periphery to provide easy access for fire protection and emergencies. The buffer zone is proposed to have dense and indigenous plantation.

Image no.3-13: Example of fencing from ALEAP Green Industrial Park, Nandigama
[Source: Murty & Manyam Architects and Engineers Ltd.]

CCTV Cameras

GIP Jadcherla has provisions for close circuit television (CCTV) cameras placed at all strategic locations in the industrial park. All CCTV cameras will be connected to the central security office.

Fire and Disaster Management

Provision has been made in the Site Master Plan for a fire station. As per *The Andhra Pradesh Gram Panchayat Land Development (Layouts and Building) Rules 2002* Amendments G.O. no. 274 (Amendment to GO. 67), a site of area 10000 m^2 has been proposed for the fire station. In addition, a disaster management centre should be provided on the first floor of the fire station to equip and manage the park in case of emergency/ disasters.

Utilities

The Site Master Plan of GIP Jadcherla has provisions for:

- Power transmission lines and a sub-station;
- Water conveyance, treatment, adequate storage and distribution within the park; and
- Telephone lines, telecommunications network.

Concerning the sites in the vicinity of the high tension electricity transmission lines, besides taking other safety precautions, a minimum safety distance (both vertical and horizontal) of 3 m shall be maintained between the building and the high tension electricity lines and 1.5 m shall be maintained between the building and the low tension electricity lines.

In case of electricity power lines, the land all along and below the power line shall be developed as a green belt to an extent of the width of the tower base; on either side of the green belt there shall be a minimum of 10 m wide roads or as defined in the Master Plan.

Installation of telecom towers should not be allowed on and around (100 m) the buildings where educational, religious, and health care institutions are functioning.

Each zone of the GIP Jadcherla shall have Optical Fiber Connectivity (OFC) to provide efficient internet and broad band connectivity to the units.

B. Technical Infrastructure

(Refer Annex II: map no. 3-8)

Warehouses/Raw Material Depots

Space for 10 warehouses has been proposed in the Site Master Plan of the GIP Jadcherla, which can be either run by an individual operator or owned by APIIC and leased by individual industries. (Refer image no. 3-14).

Image no. 3-14: Example of a warehouse at Brandix India Apparel City, Vizag, Andhra Pradesh

- Proposed size of warehouse = 25 m X 50 m,
- Gross floor area of 600 m^2 with 4 loading platforms = 1250 m^2
- Total no. of warehouses proposed = 10
- Total area required for warehouses = 12,500 m^2

Product/Material Testing Facility

One Product/Material Testing Facility is proposed. Approximate area is 200 m^2.

Business Centre

The business centre is envisaged similar to the "One-Stop-Service Centre", as provided in the APSEZ, Vishakhapatnam.

Area of site as in APSEZ= 12,000 m^2
Hence, a site of 1.2 ha is required.

The business centre will provide a bank, ATMs, post/courier service, shopping complex for industry's needs on office materials, spare parts, bearings, belts etc. It will also house conference halls and meeting rooms.

Image no. 3-15: Example of "one stop service centre" at APSEZ Visakhapatnam

Administrative Building, Information Centre and Product Display Centre

The GIP Jadcherla has provisions for an administrative building for the Industrial Area Local Authority (IALA) to function along with its various committees and sub-committees. The building complex will also house an information centre and product display centre for providing information on the industries, industrial products, vacant plots, etc. and for showcasing/exhibiting products to facilitate marketing.

Training Centre/Design Centre/Incubators

- Number of Incubator - Training Centres to be provided = 2
- Area per unit = 90 m^2
- Total area = 180 m^2

Commercial Zone

The commercial zone at the entry area to the GIP Jadcherla has provisions for commercial activities including warehouses, a shopping complex, petrol pump, etc.

Green buildings Design

Buildings should be oriented and designed to conserve non-renewable energy, reduce running costs of buildings with little or no additional building cost. Hence, it is proposed that, all the factory buildings as well as administrative buildings in the Green Industrial Park Jadcherla would be green factory buildings as per IGBC rating system. (Refer image no. 2-16).

The IGBC rating system (refer chapter 2, section – B) for green buildings take into consideration the following parameters:

- Sustainable sites
- Water efficiency
- Energy & atmosphere
- Material & resources
- Indoor environmental quality

The various levels of rating awarded are:

- "Certified" to recognize best practices
- "Silver" to recognize outstanding performance
- "Gold" to recognize national excellence
- "Platinum" to recognize global leadership

Image no. 3-16: Examples of green factory buildings at Sri City, Tada, Andhra Pradesh

Buildings/Architecture

One landmark building should be created as a unique symbol of harmony, efficiency, and sustainability within the GIP. It should represent philosophy behind the Green Industrial Park Jadcherla. Such a landmark could also enhance the scope of educational tourism to the industrial park.

Building design:

- Plots should be orientated for maximizing use of natural lighting.
- Solar passive features should be integrated into the building design such as shading of walls, windows, and roofs.
- Attempts can be made to standardize plot layout to achieve climate optimization inside the buildings in a passive or mechanical way.
- Uniform building codes (plot layout, building exteriors, signage, colours etc.) should be followed as an urban design measure.

Building materials:

- Local building materials that have minimum processing and pretreatment should be used.
- "Green Building" and "Barrier Free Building" concepts should be followed.

Building Orientation:

- Orientation and openings to maximize the north and south exposure.
- Orientation and openings to maximize natural cross flow ventilation, eg. cooling summer breezes.
- Minimize east and west facing orientation, openings, and windows, or provide adequate shading.
- Well considered landscaping will provide valuable shade throughout summer and allow for the use of the winter sun.
- Materials for buildings have been proposed to be selected based on -
  - Local availability and accessibility;
  - Ease of assembly;
  - Low operational energy needs;
  - Suitability for the project function; and
  - Dismantling and recycling.

Roof form and Orientation

- Glazing on east and west façades should be avoided or minimized with the exception of street facing façades which shall be appropriately shaded or treated to avoid solar glare.
- External shading devices (overhangs, awnings, shutters, and directional louvers) are encouraged for all north, south, west and east facing openings.
- Internal lighting should be achieved primarily through natural daylight using light shelves to provide glare free, indirect lighting, as the local sunlight tends to be harsh. Also, allowing direct penetration of sunlight into the buildings results in the heating of internal spaces.
- Provision of 'Green' roofs, combined with photo voltaic cells, has been proposed for all industrial buildings as well as common facility buildings. The roof top will therefore become a source of renewable energy and at the same time will provide shade to the roof to minimize heating, thereby reducing cooling loads. (Refer images no. 3-17, 3-18, 3-19).

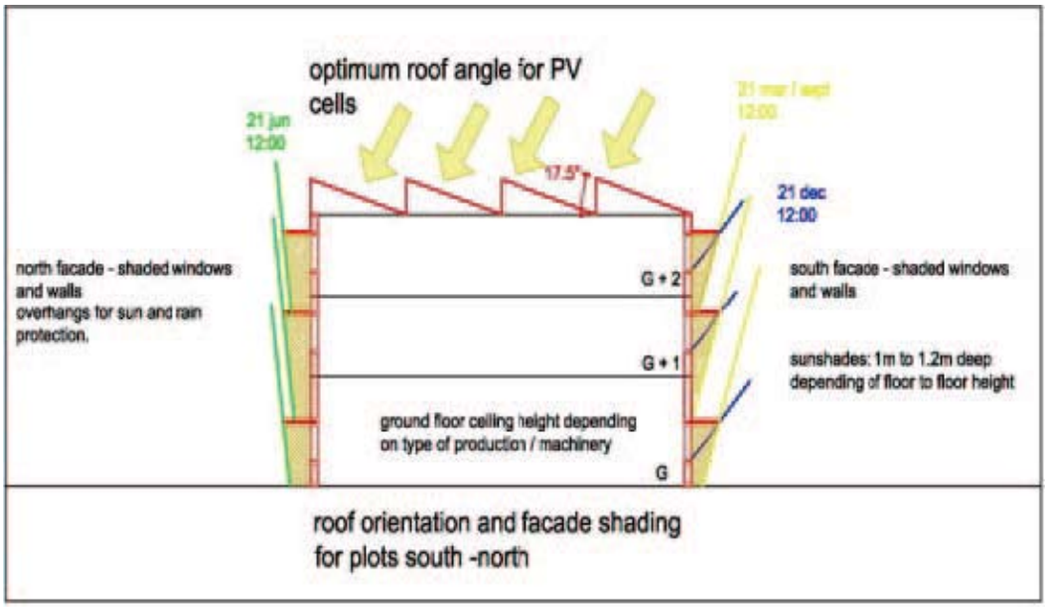

Image no. 3-17: Example of roof design

[Source: Guidelines for plot level building by Auroville Design Consulting]

Image no. 3-18: Example of roof top solar panels from Clean Tech Park, Singapore

[Clean cities.(n. d.). *Jalan Bahar Clean Tech Park.* Retrieved from http://www.usea.org/sites/default/files/event-file/497/8_Clean_Cities_Sng.pdf]

Image no. 3-19: Example of roof design for ALEAP Green Industrial Park at Nandigama, Telangana

[Source: Murty & Manyam Architects and Engineers Ltd.]

Renewable Energy/Energy Efficiency Provisions

The GIP Jadcherla has provisions for renewable energy/energy efficiency. These include:

- All buildings in the Green Industrial Park Jadcherla have to be energy efficient as per the Energy Conservation Building Code (ECBC). Process loads for industrial buildings are excluded.
- At least 25% of the installed external lighting load should be solar powered.
- 100% of internal & external lighting fixtures should be Bureau of Energy Efficiency (BEE) star rated, wherever applicable. The usage of incandescent lamps is not allowed.
- All common spaces, including street lights (where there is no use of light for reading purposes), shall use Light Emitting Diode (LED) lamps. (Refer image no 3-16)

Image no. 3-20: Example of solar powered LED street lights

[Source: Truelite energy innovations. (n. d.). *Solar street lights.* Retrieved from http://www.truelite.us/solar-street-lights/]

- To save energy at night, it is recommended that shielded lights (refer image no 3-17), are provided. This will save energy, monetary expenses as well as night sky pollution. Such a provision can minimize glare and make driving easier on the eyes at night.

Image no. 3-21: Example of proposed shielded flood lights

[Source: Sky and Telescope. (n. d.). Retrieved from http://www.skyandtelescope.com/astronomy-resources/your-home-lighting-guide/]

- To save energy and promote a sense of collective approach towards renewable energy, it is recommended that solar power should be used for the cooking purposes at central canteen at the amenity number 9. (refer image no 3-18)

Image no. 3-22: Example of renewable energy application for steam generation at Akshar Dham temple, New Delhi for community cooking[46]

Image no.3-23: Solar bowl at the solar kitchen- Auroville's community kitchen

[Source: The Power of Human Unity. (n. d.). *Solar Bowl at the Solar Kitchen - Auroville's community kitchen.* Retrieved from http://www.aurore.in/the%20power%20of%20human%20unity%20june_2004.pdf]

46 Clique Solar. (2013, July). *"ARUN® Solar Thermal System & its applications.* Presented in International Conference on Green Enterprises and Green Industrial Parks. Hyderabad, India.

C. Environmental Infrastructure

Storm Water Management

The storm water management system provided for the Site Master Plan of GIP Jadcherla includes:

- Storm water drainage will be provided in the Site Master Plan to collect rainwater. The slopes/contours of the industrial park have been assessed and accordingly the entire site has been divided into various zones. (Refer Annex II: map no. 3-10). Storm water drains should be provided along the roads accordingly.
- The storm water collected from each zone will be collected in lined tanks, tested and treated if required, and then sent for recycle/reuse. The storm water collection would be on the basis of 1 hour peak rainfall with 85% coefficient of runoff. (Refer to Rain water harvesting and conservation manual, Central public works department, New Delhi)
- The rainwater over and above 1 hour peak rainfall will flow to the recycle/reuse tanks or ponds. Rainwater from areas without any contamination risks would only be diverted for rainwater harvesting.
- Rainwater, after treatment if necessary, will be collected in ponds that will be integrated within the green landscape to serve in aesthetics as well as micro-climate control. Additionally, it will also be used for gardening/ horticultural purposes and for industrial uses, if there is a demand.
- Seven locations have been identified in GIP Jadcherla for ponds. As per the volume of water expected to be collected in the watershed, the pond areas were calculated. This area has been integrated into the green areas to co-create storm water management and recreational zones, which can be visually attractive, cost effective, as well as socially functional.
- The services for storm water management will be taken up through appropriate business cases (e.g. PPP).
- Individual industries should be required to recycle/reuse storm water collected from their premises, after treatment.

The locations and capacities of the storm water storage ponds have been derived from watershed analysis of the area (refer image no 3-25) and rainfall data of last 5 years (Refer Table no. 3-10). Proposed ponds have capacity to retain 100% peak rainfall water.

Table no. 3-10: Details of rainfall at Jadcherla in Mahboobnagar District

S. No.	Month	Rainfall (mm)						
		2007	2008	2009	2010	2011	2012	2013
1	January	N.A.	0	0	0	0	0	0
2	February	N.A.	26	0	0	0	0	49.3
3	March	N.A.	124.2	7	0	0	0	0
4	April	N.A.	0	0	0	20.4	68.8	0
5	May	N.A.	0	9.2	7.2	72.2	16.8	29.6
6	June	120.6	38	101.4	37.2	76.2	56.8	N.A.
7	July	84.8	162.8	100.6	236.8	159.8	141.4	N.A.
8	August	124.4	218.8	203.8	162.4	268	161	N.A.
9	September	273	91.2	281.2	179.8	68	96	N.A.

S. No.	Month	Rainfall (mm)						
		2007	2008	2009	2010	2011	2012	2013
10	October	39.4	28.2	75.8	85	33.4	114.6	N.A.
11	November	35.6	14.6	62.6	15.2	0	47.6	N.A.
12	December	0	0	0	5	0	0	N.A.

Source: TSIIC

Note: N.A stands for data not available

Table no. 3-11: Details of ponds

S. No.	Name	Length (m)	Breadth (m)	Depth (m)
1	Pond no. 1 (N.G.- 6)	60	50	4
2	Pond no. 2 (O.S. -10)	50	40	2.5
3	Pond no. 3 (Amen - 7)	50	40	2.5
4	Pond no. 4 (N.G.- 2)	50	30	2.5
5	Pond no. 5 (N.G.- 1)	30	20	2.5
6	Pond no. 6 (O.S.- 4)	50	30	2.5
7	Pond no. 7 (O.S.- 7)	40	30	2.5

Source: Estimated by GIZ- IGEP

Image no. 3-24: Example of rainwater harvesting pond

[Source: Retrieved from http://www.dukechronicle.com/articles/2012/03/21/pond-save-water-provide-park-space]

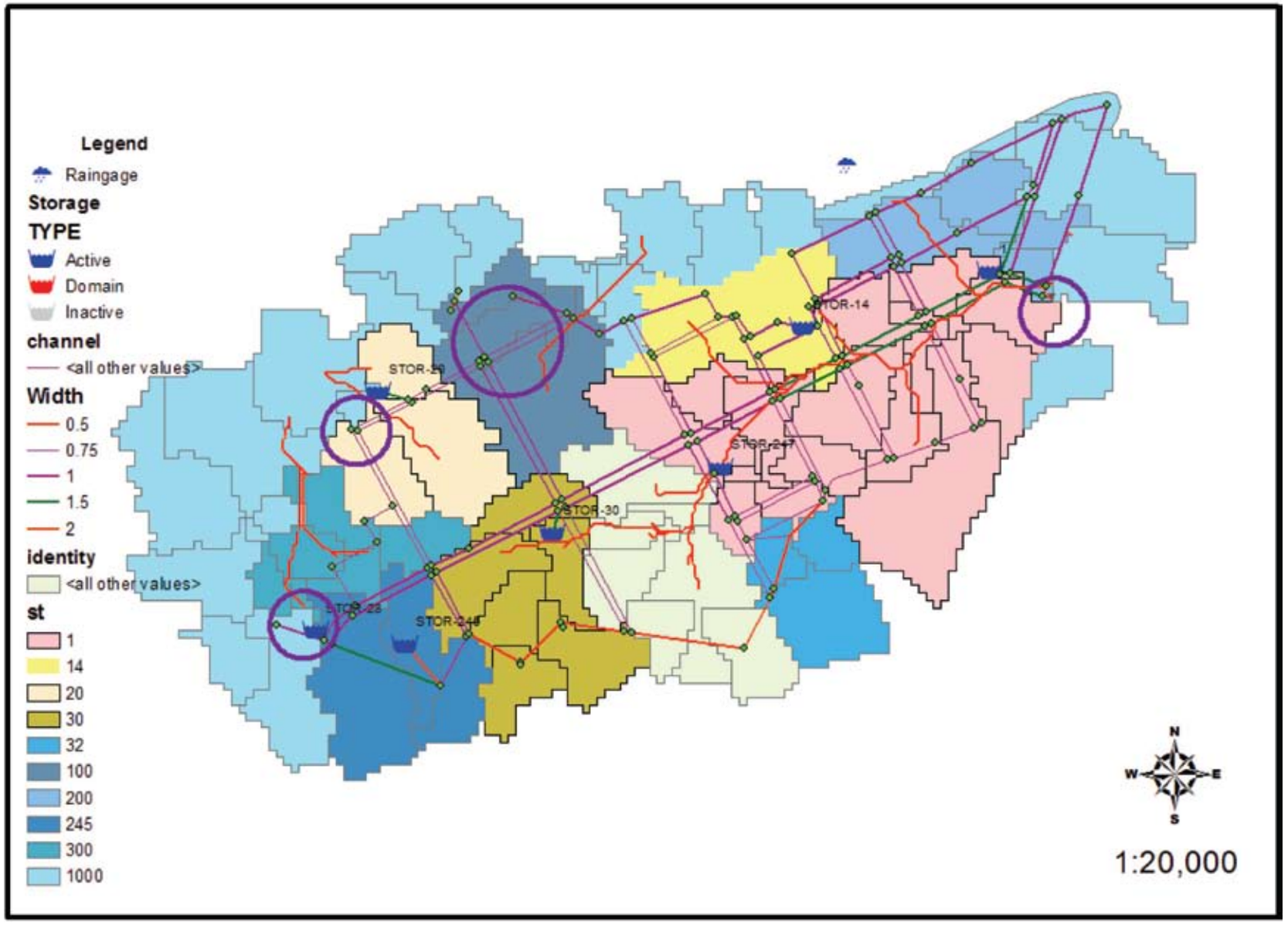

Image no.3-25: Micro watershed analysis, width of drains and location of rain water collection ponds

[Source: GIZ-IGEP]

Wastewater Management

The Site Master Plan has the following provisions for waste water management:

- Provisions for wastewater conveyance system in accordance with slopes and zoning of industries;
- Provisions for common effluent treatment plants, sewage treatment plants; and
- Provisions for storage of treated waste water and provisions for recycle/reuse.

The Green Industrial Park Jadcherla will house only non-polluting industries. The wastewater (industrial and domestic) expected from the Green Industrial Park is about 2 MLD, but probably would not exceed 4 MLD. The wastewater quality will be of an easily biodegradable nature with COD[47]: BOD ratio of less than 2. Decentralized wastewater treatment would be appropriate for the site, taking into consideration the following:

- Easy to operate and maintain;
- Reliability of wastewater treatment;
- Recycling possibilities of treated wastewater for industrial/horticulture use; and
- Low operating and maintenance costs.

Seven decentralized wastewater treatment plants are suggested for the site. They will be located in the earmarked areas together with the storm water pond areas as these locations are catering to the industrial zones as well as aligned with the slopes/contours of the site. (Refer Annex II: map 3-10). The possible treatment schemes are indicated below. (Refer image no. 3-26, 3-27).

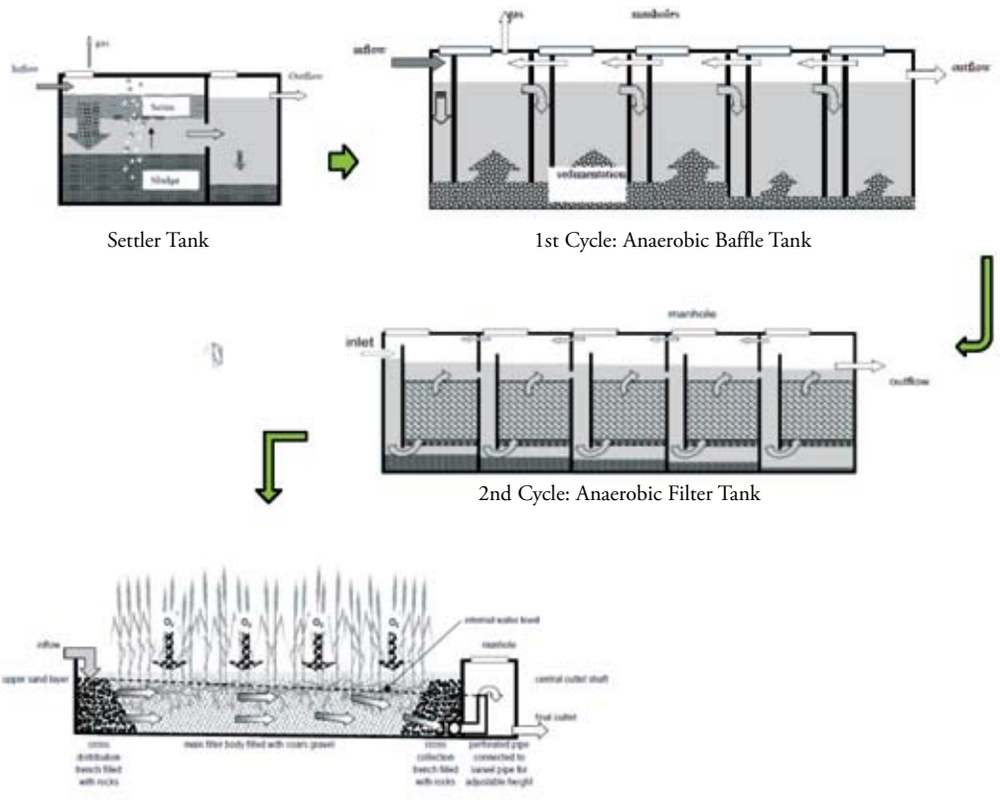

Image no. 3-26: Decentralized wastewater treatment system with root zone treatment[48]

47 COD stands for Chemical Oxygen Demand, BOD stands for Biochemical Oxygen Demand

48 Auroville Centre for Scientific Research

Image no. 3-27: Decentralized treatment system with schauberger vortices

The treated water (after complying with the required standards) shall be recycled/ reused. For this purpose, any additional requirements for tertiary treatment, depending on the reuse requirements, should also be incorporated. For recycling purposes, online monitoring systems for pollution parameters should be installed before and after the treatment of wastewater. Also, for irrigation systems, the required infrastructure, including conveyance systems, sprinklers, etc., should be installed.

The GIP Jadcherla is not expected to have any not-easily-biodegradable effluents (COD : BOD ratios higher than 2.5) and toxic effluents (such as biocides, carcinogenic substances, heavy metals, any tenacious and non-degradable synthetic substances, and mineral oil products).

The legal provisions under environmental laws -such as the Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981, Environmental (Protection) Act 1986, etc. should be strictly adhered to while planning, designing, establishing, and operating the wastewater treatment plants.

Solid Waste Management

GIP Jadcherla has provisions for solid waste management including collection, transportation, storage, and disposal of wastes (Recycling Centre), including MSW[49], e-waste, hazardous and industrial wastes. Provisions for a vermi-compost plant and handmade paper unit and provisions for dust bins in the public areas are part of this scheme.

- For waste recycling industries, five acres have been earmarked. In this area, facilities such as a vermi composting plant for recycling compostable organic wastes, a handmade paper plant for recycling of waste paper, etc. would be encouraged through micro enterprises, which will help covert wastes to products as well as provide employment and means of income generation. (Refer image no. 3-38, 3-29).
- Provisions have been made in the road cross sections for roadside dustbins.
- Provisions have been made in the zonal facility centres for collection of wastes from the zone. Wastes shall be collected separately depending on the types of wastes, including hazardous wastes (Refer Hazardous Wastes (Handling and Management Rules), municipal solid wastes (Refer Municipal Solid Waste Management Rules), plastic wastes (Refer Plastic Wastes Management & Handling Rules), e-wastes (Refer e-Wastes Management and Handling Rules) etc. The wastes should be treated and disposed of in accordance with the environmental

49 MSW stands for Municipal Solid Waste

laws and rules. Based on viable business models, service delivery models should be set up for waste management.

Image no. 3-28: Example of vermi-compost plant at ALEAP Industrial Park, Gajularamaram

[Source: GIZ-IGEP]

Image no. 3-29: Example of handmade paper unit at ALEAP Industrial Park, Gajularamaram

[Source: GIZ-IGEP]

Green/Open Spaces/Landscapes

The green spaces in GIP Jadcherla have the following main functions:

- Micro-climatic control (temperature, heat, etc.);
- Aesthetics and leisure space. (Refer image no. 3-33, 3-34, 3-35);
- Pollutant absorption;
- Serve as walking trails ; and
- Serve as buffer to the industrial activity and road transportation.

Key features of the green/open spaces/landscapes are:

- Hierarchy of green spaces has been proposed in the industrial park in following manner:
  - Central green – lung space for the industrial park;
  - Green belts at the periphery to act as a buffer;
  - Vertical and horizontal stretches of greens spreading across the GIP in the form of avenue plantations and greenways (Refer image no. 3-32); and
  - Greens at the plot level.

- Parallel green corridors ending in big open spaces or zonal facilities are provided to serve as eco-friendly walk ways.
- Avenue plantations have been proposed along the major roads to give shade to vehicles, reduce pollution, and provide beautiful streetscapes to onlookers.
- Landmarks with signature architecture have been proposed at the central green.
- Aquatic plants, fishes, and water edge vegetation are proposed to be grown in rainwater harvesting ponds for effective mosquito control and balance of nutrients in the water.
- Types of plants that should be considered for landscaping in GIP are:
  - Native plant species that make a positive contribution to biodiversity conservation, particularly with reference to pollinators;
  - Drought tolerant species that will reduce the use of water resources should be used;
  - Plants that have commercial potential in the preparation of herbal products;
  - Pest tolerant species that do not require toxic chemicals; and
  - Pollution resistant species as well as species that help in pollutant absorption should be used. (Refer Publication of the Central Pollution Control Board on 'Guidelines for Development of Green Belts'[50]).
- Landscaping at the entry/exit points and at central zones; provisions for interconnected landscapes with network of primary and secondary greens to provide visual and functional continuity, functions of beautification, buffer, micro-climate control, promotion of existing habitat, etc.;
- The existing situation of plantation and types were obtained from aerial photographs and site visits. The visual character and spatial definition of a site is impacted by the amount and category of vegetation – from ground cover to canopy, from new growth to mature stands of trees, etc. Plant coverage enhances soil stability, provides an indication of soil conditions (e.g., wetlands), and relates to potential wildlife habitats. Therefore, in the GIP Jadcherla, areas with extensive mature vegetation were proposed not to be disturbed or modified.

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Image no. 3-30: Existing vegetation on site

50 Central Pollution Control Board, Ministry of Environment and Forests, Government of India. (2000). *Guidelines for Developing Green Belts.* Delhi, India. Retrieved from http://www.cpcb.nic.in/upload/Publications/Publication_513_GuidelinesForDevelopingGreenbelts.pdf

- The site has existing mango plantations at one location, which is acting as a buffer for industries at the same time as it is enhancing the commercial benefits of the GIP. Hence, it has been retained as a green area. (Refer image no. 3-30)
- A bio-swale located in the south west area of the GIP should be developed as a new habitat area to support local species and bio-diversity. Green belts with a noise absorption function should be provided along the highway towards the eastern edge of the industrial park. (Refer image no. 3-31)

© Happold

Image no. 3-31: Natural Bio-swale in GIP Jadcherla

[Source: Site visit by experts from BuroHappold Engineering, Germany]

- While working on the master plan of the GIP Jadcherla, it was observed that there is no provision of buffer zones along the site boundary but the plots have been allotted to industries. Hence, buffer zones have been provided in the master plan wherever it was possible, considering the status of allotted plots. (Refer Annex II: map 3-7).

All the above inclusions were done keeping in mind the DTCP norms of 10% minimum green in a site layout. (Refer Annex II: Map 3-2).

Image no. 3-32: Example of greenery from APIIC's industrial parks

[Source: Nagabhushanam G .(2013, July). *APIIC- Retrofitting of Old Industrial Parks-Case of Nacharam and Mallapur. Green Industrial Parks-concepts and cases.* Presented in International Conference on Green Enterprises and Green Industrial Parks. Hyderabad, India.

Image no. 3-33: Example of landscaping at APSEZ, Visakhapatnam

[Source: GIZ-IGEP]

Image no. 3-34: Example of landscaping at Beijing Economic-Technological Development Area, China

[Source: Babu N.R. (2013, July). *Green Industrial Parks-concepts and cases.* Presented in International Conference on Green Enterprises and Green Industrial Parks. Hyderabad, India]

Image no. 3-35: Example of greenery and its nursery at Sri City, Tada, Andhra Pradesh

[Source: Sri City Pvt Ltd. (2013, July). *Sri City-An Integrated Business City of unparalleled opportunities.* Presented in International Conference on Green Enterprises and Green Industrial Parks. Hyderabad, India]

Resource Efficiency

GIP Jadcherla has provisions for resource efficiency, including:

- Provisions for rainwater harvesting, recycle/reuse of water (Refer to the section on storm water);
- Provisions for recycle/reuse of treated wastewater (Refer to the section on wastewater);
- Provisions of renewable energy (Refer to the section on energy);
- Provisions for green factory building. (Refer to the section on energy);

Environmental Monitoring

GIP Jadcherla has provisions for online monitoring of air quality in the industrial park. The data will be displayed inside the industrial park as well as at the entry/exit points. Also, the data will be accessible via internet.

Image no. 3-36: Example of online monitoring and display systems at Map Ta Put Industrial Estate in Thailand

D. Social & Functional Infrastructure

The social infrastructure in the industrial park will cater to the industrial park as well as to the rehabilitation area. (Refer Annex II: map. No. 3-8). It is detailed below:

- Education and training:
  - A university campus has been provided at the central location of the GIP.
  - Provisions have been made for incubators, training facilities, product testing facilities, environmental monitoring facilities, etc.
- Gender specific:
  - To cater to women employees, provisions for public toilets and dormitories have been made within the Site Master Plan of the GIP Jadcherla. Provisions for strengthening safety and security have been made for the GIP Jadcherla Site Master Plan. Special provisions have been made for crèche, rest rooms for extended work, health centre, canteens/food outlets, kiosks, internal shuttle service (battery operated), external connection to public transport, water dispensers, guest house, ladies room etc.
  - The Women Entrepreneurs Industrial Zone of the GIP Jadcherla will prepare its own Site Master Plan specific to their requirements.
- Health care:
  - Two dispensaries have been proposed for the GIP Jadcherla; one at the central facility zone and one within the facilities for the rehabilitation zone.
- Worker specific:
  - Township to accommodate employees/workers housing – two housing areas (rehabilitation areas) have been planned. Separate Site Master Plan should be prepared for these areas incorporating environmental and sustainability concepts.
  - GIP Jadcherla has a guest house for visitors and service engineers etc., and dormitories for workers.

Image no. 3-37: Example of guest house at Brandix India Apparel City, Vizag, Andhra Pradesh

Image no. 3-38: Example of food court at Brandix India Apparel City, Vizag, Andhra Pradesh

- Special arrangements have been made for truck drivers for their stay, repair of trucks, food and sanitation.
- For the benefit of workers and employees, provisions have been made for parking of vehicles, internal and external transport.
- Provisions have been made for drinking water, ATMs, play, schools, medical facilities, a dispensary/ health centre, a post office, an internet centre, common toilets, shops for convenience goods, crèche, and accommodation for late working shifts.
- Provisions for tea shops, small restaurants, and kiosks with sitting spaces have been made.
- For safety & security of employees, provisions for CCTV cameras, fencing for the GIP, a security office and security cabins have been made.
- A dormitory has been proposed at the central facility area for truck drivers. The dormitory will have beds and attached toilets, cooking facilities, and a shop catering to daily needs.
  - Number of truck drivers = 268
  - Number of total person at central facility = 537
  - Number of users = 200 (approx.)
  - Area required per person = 12 m^2
  - Total built up area = 2400 m^2
  - Area of site required (Considering F.A.R =1.5) = 1600 m^2

- **Common infrastructure for workers** in GIP Jadcherla includes canteens, kiosks, safety/security, public toilets, accommodation/dormitory for workers, crèche, etc. (Refer image no. 3-39).

Image no. 3-39: Example of a public toilet

[Source: CEPT University. (2012). *Climate Change adaptation plan for industrial estates of Gujarat.* Ahmedabad, India]

Public Toilets

Toilet facilities are suggested to be provided at the central facility zone, entrance/ exit zone, individual zone level and at road side. It is assumed that 80% of sanitary requirements shall be met at the industrial plot level.

Based on the prevalent norms for provision of sanitary facilities, the following standards have been derived.

Table no. 3-12: Derived standards for provision of public toilets

S.No.	Use/ Activity	Toilet seats	Baths	Urinal units	Clothes washing area
1	For Commercial area	1 per 50 users	Not required	1 per 20 users	Not required
2	For Industrial area	1 per 30 users	Not required	1 per 20 users	Not required
3	For Community area	1 per 20 users	1 per 30 users	1 per 50 users	1 per 40 users; 1.5 m x 1.2 m
4	For roads	2 in a radius of 500 m	Not required	2 in a radius of 500 m	Not required

Note: Standards mentioned above have been derived from – GOI (1996); A compendium of Central Schemes for Urban development, Urban Transport and Public Health Engineering, from the Ministry of Urban Affairs and Employment, Government of India, 1996.

Requirement at Central Facility Zone

- Number of truck drivers = 268
- Number of total users = 537
- No. of Toilet seats (2 toilet seats for women with separate entry) = 7 (for males) + 2 (for females)
- No. of Urinal units required = 21
- No. of type 1 toilet blocks required (Refer Annex I: 3-8) = 2
- Area = 29 m^2

Requirement at Individual Facility Zones

Table no. 3-13: Requirements at zone level

Zone	Line of Activity	No. of Truck Drivers	Service Population	Visitor Population	Users For Common Facility	Toilet Seats Required	Urinal Units Required
Zone 1	General engineering	340	1162	310	362	5 (for males), 2 (for females)	18
Zone 2	SEZ	1261	553	195	402	6 (for males), 2 (for females)	20
Zone 3	MSME	47	1158	990	439	6 (for males), 3 (for females)	22
Zone 4	Green Industry	62	800	400	252	4 (for males), 1 (for females)	13
Zone 5	Women Industrial Park	79	600	600	256	3 (for males), 10 (for females)	5

Note: In women's Industrial parks the ratio of toilet seats and urinals for no. of users has been reversed based on the gender.
Source: Estimated by GIZ-IGEP

Table no. 3-14: Number of toilet blocks required at zonal level

Zone	Type 1 blocks required	Type 2 blocks required	Type 3 blocks required	Area of toilet blocks required
Zone 1	2	0	0	30
Zone 2	2	1	0	30
Zone 3	2	0	1	50
Zone 4	2	0	1	50
Zone 5	0	1	1	30

Source: Estimated by GIZ-IGEP
Refer annex I: 3-8 for a description of Type 1, Type 2, and Type 3 toilet blocks.

- **Canteens**

Food services are proposed for the workers, visitors, and employees at the central parking level as well as at the zone level. These include:

- Canteens that provide meals;
- Restaurants / cafeterias attached to the APIIC Business Centre;
- Food kiosks for quick breaks and refreshments along green ways, main roads; and
- Shaded food stations near the zone level greens.

Area proposed for food facilities are mentioned in table no. 3-15.

Table no. 3-15: Provision for canteens

S. No.	Location	Area (m^2)
1	Centralized truck parking facility (500 persons)	2000
2	Cafeteria at zone levels (50 persons)	300

Note: 4 m^2 per person for the canteen are allotted while 6 m^2 are proposed for the cafeteria
Source: Estimated by GIZ-IGEP

At the central zone, within truck parking facility, a mass kitchen is proposed and at the zone level facilities cafeteria is proposed.

Recreational and socio-cultural infrastructure

Provisions have been made in public spaces for the benefit of employees/workers. These include sports fields, an amphitheater/auditorium, landmark area, green/landscaped area, etc.

After input of all the components, the existing master plan of GIP Jadcherla has been revised as per the norms and standards. (Refer chapter no. 2). All the major components have been depicted in the revised master plan for GIP Jadcherla (Refer Annex II: Map no. 3-9)

Chapter 04
Revised Site Master Plan of the Green Industrial Park at Jadcherla

A. Highlights of the Site Master Plan of GIP Jadcherla

Overview of the Site Master Plan

Total area of the site	• 3.87 km^2 (956.58 acres) (as measured from drawing)
Expected number of enterprises	• About 350 to 400
Expected number of service related entrepreneurs catering to GIP	• About 50
Project cost	• Approx. INR 250 cr[51] (incl. land cost, infrastructure and services; excl. factory buildings cost) (≈ 41 million $)
Expected employment generation	• 20,000 (direct employment)
Targeted investments	• INR 1,000 cr (≈ 165 million $)
Site Master Plan inputs by	• Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH • Buro Happold Engineering, Berlin, Germany • German Sustainable Building Council (DGNB), Germany
Site Master Plan finalization by	• Advisory Group of APIIC • Working Team of APIIC

Scale of the Site Master Plan

The Site Master Plan has been drawn in Auto Cad in metric system. Hence, the plan can be digitally printed in all scales required for submissions to local authorities for approvals:

- Revised master plan has been provided in 1:5000 scale

[Refer to Comparison of scale of maps, Urban and regional development, plan formulation and implementation guidelines, 2014, Ministry of Urban Development, India]

Land Use as per Site Master Plan

In the previous master plan (Refer map no. 1-1), the uses like public amenities, parks and open spaces etc. were skewed towards corners. In the revised Site Master Plan, the facilities have been given central locations. The land

51 Cr stands for Crore. A Crore is a unit in the south Asian numbering system equal to ten million.

at the site has been used optimally and efficiently. All the uses have been placed so as to avoid land use conflicts, to the best extent possible. The industrial park has been re-planned keeping in mind the norms and standards as discussed in Chapter 2 & 3. (Refer Annex II: map no. 3-2). Details of land use are given below.

Table no. 4-1: Area available for industrial development

S. No.	Category	Area (m^2)	Area (Acres)
1	Gross area under site boundary	3871049.68	956.58
2	Area not available for industrial development		
2.i	Area within the rehabilitation zone	129091.64	31.90
2.ii	Area with the boundary of graveyards	24199.62	5.98
2.iii	Area covered by Tanda	36299.43	8.97
2.iv	University	361901.74	89.43
	Net area	3319557.22	820.30

Note:

1. An acre is equal to 4046.76 m^2
2. Area allotted to SEZ is industrial area by function, hence added in the net area.
3. All area are as per calculated from actual boundary in the drawing.
4. Area covered under National Highway- 7 widening is not a part of site boundary, hence it cannot be subtracted.

Industrial Zoning as per Site Master Plan

The revised master plan has logically placed zones based on homogeneity of function and inter-relationships to get the best use of the land (Refer Annex II: map no. 3-1, 3-2). The zones in GIP Jadcherla are given below.

- Zone 1: Special Economic Zone (SEZ)
- Zone 2: General Engineering Zone
- Zone 3: Micro, Medium and Small Enterprises (MSME) Zone
- Zone 4: Green Industry Zone
- Zone 5: Women Entrepreneurs Industry Zone
- Zone 6: Commercial Zone
- Zone 7: University Zone
- Zone 8 (a) and (b): Rehabilitation Zone

The distribution of the land uses in GIP Jadcherla is proposed as per Andhra Pradesh industrial layout standards (refer chapter no. 2). Details are:

Table no. 4-2: Land use distribution in the net area of GIP Industrial Park

S.No.	Land use	Standard*	Area (in acres as per previous master plan)	Area (in acres as per proposed master plan)
1	Industrial	(55%-60%)	544.3 (66.4%)	491.07 (60.4%)
2	Recreational Buffer zones, parks, water bodies, green under high tension lines etc.	(10%-12%)	66.9 (8.2%)	81.87 (10.1%)
3	Commercial Shopping centre, petrol pumps, guest house / budget hotels, lodging and boarding, service and repair shops, communication / telephone exchange etc.	2%-3%	28.0 (3.4%)	33.20 (4.0%)
4	Facilities Public and semi – public: fire station/ fire post, police station / police post, hospital / dispensary, day care centre etc. utilities: electric sub-station, CETPs, pumping station, underground reservoir / fire fighting tanks and other utilities etc.	(8-10%)	15.3 10.0 (3.1%)	39.3 10.0 (6.0%)
5	Transportation Circulation, loading / unloading area, parking, goods vehicle parking etc.	(18-20%)	155.7 (19.0%)	164.2 (20.0%)
	Total area		**820.3**	**820.3**

For allowed industries and restricted industries in GIP Jadcherla, refer to Chapter 3.

Industrial Plots in Site Master Plan

Provision for a diversity of plots ranging from 500 m^2 to more than 200,000 m^2 allows for flexibility within the industries and has made the GIP inclusive for all level of entrepreneurs. For details, refer to Chapter 3.

B. Basic Infrastructure Provided for the GIP Site Master Plan

1. Road network	■ 45 m R-O-W (2 types) (3+3 lanes, median, pedestrian track, two side cycle track, storm water drain, water supply, electrical line and avenue plantation with sitting spaces) ■ 36 m R-O-W (2 types) (2+2 lanes, median, pedestrian track, two side cycle track, storm water drain, water supply, electrical line and avenue plantation with sitting spaces) ■ 24 m R-O-W (2 types) (1+1 lanes, pedestrian track, one side cycle track, storm water drain, water supply, electrical line and avenue plantation with sitting spaces) ■ 20 m R-O-W (1 type) (1+1 lanes, pedestrian track, storm water drain, water supply, electrical line, parallel parking lane, buffer plantation and avenue plantation)

	■ 15.3 m R-O-W (3 types) (1+1 lanes, pedestrian track, storm water drain, water supply, electrical line, parallel parking lane, buffer plantation / avenue plantation) ■ 15 m R-O-W (1 type) (1+1 lanes, pedestrian track, storm water drain, water supply, electrical line, avenue plantation) ■ 12 m R-O-W (1 type) (1+1 lanes, storm water drain, water supply, electrical line, buffer plantation) ■ 6 m R-O-W (1 type) (1 lane, storm water drain, water supply, electrical line, buffer plantation
2. Entry/Exit Provisions	■ The main entry gate at the eastern part of GIP will have signature architecture to reflect the unique identity of the Green Industrial Park and will also integrate local architectural elements. Additional facilities: ▸ A security cabin; ▸ An information centre; ▸ A GIP Map; ▸ Parking facilities – to provide for adequate parking/standing; to avoid queuing at the entry/exit; to provide for parking for those who want to use bicycles or battery operated vehicles; ▸ Bus parking for external transport; ▸ Bus parking for internal transport; ▸ Adequate front space (in front of gate) for landscaping; ▸ Public toilets; and ▸ A drinking water facility. ■ There is also a second entry point for workers/employees on the western side of the Industrial Park. This gate has provisions for: ▸ A security cabin; ▸ A GIP Map; ▸ Parking facilities – to provide for parking for those who want to use bicycles or battery operated vehicles; ▸ Bus parking for external transport; ▸ Bus parking for internal transport; ▸ Adequate front space (in front of gate) for landscaping; ▸ Public toilets; and ▸ A drinking water facility.
3. Mobility - Eco Efficient Transportation	■ External linkages: ▸ External road linkages to the GIP Jadcherla from the nearby settlements from where the workers/employees will travel to the GIP. ▸ External linkages from the railway station, bus station etc. to GIP Jadcherla. Bus stops and pedestrian access points have been provided near the main entrance and the second entrance on the western side of the park.

	▸ Eco-friendly public transportation such as battery operated vehicles, CNG buses to operate from the GIP to the nearby settlement, housing areas, railway station, bus station, etc. ▸ Foot bridge crossing the highway in front of the GIP Jadcherla. ▸ Bicycle and pedestrian network from surrounding settlements to GIP and within GIP. ■ Internal mobility: ▸ Battery operated vehicles for internal transport. ▸ Provisions for bus stops/shelters throughout the GIP Jadcherla. ▸ Bicycle tracks and spaces for bicycle stations. ▸ For private vehicles, adequate parking facilities have been provided at the entry/ exit points, at central level and at zonal level.
4. Bicycles Ways	■ Bicycle tracks, bicycle stations and bicycle parking facilities have been provided extensively to encourage bicycling to work.
5. Pedestrian Network	■ Extensive pedestrian network consisting of sidewalks along roads and Green pathways to create a system of safe and convenient pedestrian movement.
6. Parking at GIP Jadcherla	■ Parking provisions have been made at: a) park level (overnight stay), b) zone/cluster level (temporary stay), and c) plot level (loading/unloading). Refer to Chapter 3 for details. Parking provisions include: ▸ Centralized truck and vehicle (cars, scooters) parking and zone Level truck parking; ▸ Truck and vehicle parking at entry/exit gates; ▸ Bus bays; and ▸ Bicycle parking.
7. Automobile Service Station	■ 2 service stations/ workshops are provided for in the GIP Jadcherla, particularly to cater to trucks
8. Weigh Stations	■ 2 weigh stations have been provided in the GIP Jadcherla.
9. Signage	■ The GIP Jadcherla will have systematic signage, including: ▸ Directional signage along major roads, pedestrian ways and bicycle ways; ▸ Signage on landmarks, central facilities, zonal facilities etc.; ▸ Signages pertaining to names of industries should be uniform in placement and dimension; ▸ Information signage; and ▸ Advertisement boards/hoardings.
10. Security	■ A centralized security office will be located at the main entrance of GIP. In addition, security cabins at the entry and exit points we be realized. ■ CCTV cameras will be placed at strategic locations in the industrial park.
11. Fencing	■ Elegantly designed fencing all around the industrial park will be made of environment-friendly materials.

12. Fire and Disaster Management	■ Provision for a fire station. [Ref. The Andhra Pradesh Gram Panchayat Land Development (Layouts and Building) Rules – 2002 – Amendments – G.O. no. 274 (Amendment to GO. 67)] ■ Disaster management centre at the first floor of the fire station to manage the park in case of emergency/ disasters. Disaster management team with pool of experts from industries.
13. Utilities	■ Power transmission lines and a sub-station. ■ Water conveyance, treatment, adequate storage and distribution within the park. ■ Telephone lines, telecommunications network.

C. Technical Infrastructure Provided in the GIP Site Master Plan

1. Warehouses/Raw Material Depots	■ 10 warehouses to be provided (25 m X 50 m each)
2. Product/Material Testing Facility	■ One product/material testing facility is proposed. (Site area 200 m^2)
3. Business Centre (One Stop Service Centre)	■ A business centre is to be provided similar to the "One-Stop-Service Centre", provided in APSEZ.
4. Administrative Building, Information Centre and Product Display Centre	■ Provision for an administrative building for the Industrial Area Local Authority (IALA) to function along with its various committees and sub-committees. ■ The building complex will also house an Information centre and product display centre to provide information on the industries, industrial products, vacant plots, etc. and for showcasing/exhibiting products for marketing purposes.
5. Training Centre/ Design Centre/ Incubators	■ Training centre to undertake training needs, including vocational training, entrepreneurship development, etc. ■ Design centre to provide AutoCad services, drawing, and design services. ■ Incubators for entrepreneurship promotion.
6. Commercial Zone	■ The commercial zone at the entry area to the Industrial Park has provisions for commercial activities including warehouses, a shopping complex, a petrol pump, etc.
7. Green Factory Buildings	■ Every industry will have green factory building in accordance with IGBC norms.
8. Renewable Energy/ Energy Efficiency Provisions	■ All buildings would have to be energy efficient as per the Energy Conservation Building Code (ECBC). Process loads for industrial buildings are excluded. ■ At least 25% of the installed external lighting load should be solar powered. ■ 100% of internal & external lighting fixtures should be BEE star rated, wherever applicable. The usage of incandescent lamps is not allowed. ■ All common spaces, including street shall use "LED". ■ To save energy and night sky pollution, shielded lights are proposed. ■ To save energy and promote a sense of collective approach towards renewable energy, it is recommended that solar power should be used for the cooking purposes at central canteen at the Amenity number 9.

D. Environmental Infrastructure Provided in the GIP Site Master Plan

1. Storm Water Management	■ Storm water drains all across GIP Jadcherla. ■ Decentralized storm water management system for cost effectiveness. ■ Collection and treatment of run-off of first rains at 1 hour peak rainfall to avoid any contamination risks. ■ Pooling of water and integration into green landscapes. ■ Recycle/reuse provisions for industrial, horticulture/irrigation uses.
2. Wastewater Management	■ Provisions for wastewater conveyance system in accordance with slopes and zoning of industries. ■ Provisions for common effluent treatment plants, sewage treatment plants. ■ Provisions for storage of treated waste water (guard pond) and provisions for recycle/reuse.
3. Solid Waste Management	■ Provisions for collection, transportation, storage, and disposal of wastes. ■ Elegantly designed dustbins in public places. ■ Recycling Centre for e-waste, vermi-compost plant, and handmade paper plant etc. ■ Hazardous waste collection and temporary storage facility.
4. Green/Open Spaces/ Landscapes	■ Central green – lung space for the industrial park. ■ Green belts at the periphery- to act as a buffer. ■ Vertical and horizontal stretches of greens spreading across the GIP in the form of an avenue and greenways. ■ Greens at the plot level.
5. Resource Efficiency	■ Provisions for rainwater harvesting, recycle/reuse of water. ■ Provisions for recycle/reuse of treated wastewater. ■ Provisions of renewable energy. ■ Provisions for green factory buildings.
6. Environmental Monitoring	■ Online monitoring of air quality in the industrial park. ■ Data display inside the industrial park as well as at the entry/exit points. ■ Data display via internet.

E. Social Infrastructure Provided in the GIP Site Master Plan

1. Food and beverages	■ Canteens ■ Kiosks, tea/coffee shops ■ Restaurants ■ Safety/security provisions ■ Public toilets ■ Accommodation/dormitory for workers and truck drivers
2. Education and training	■ GIP has a university campus
3. Entrepreneurship development	■ Incubators ■ Training facilities
4. Recreational facilities	■ Sports fields ■ Amphitheater/auditorium ■ Landmark area ■ Green/landscaped areas
5. Housing	■ Two housing areas (rehabilitation areas) have been planned. ■ Detailed layouts should be prepared for these areas incorporating environmental and sustainability concepts.
6. Guest House	■ Guest House for visitors and service engineers etc.
7. Special arrangements for truck drivers	■ Dormitories for stay, repair of their trucks, cooking, and, hygiene.
8. Transportation/ mobility arrangements	■ Parking facilities for vehicles. ■ Eco-friendly internal public transport. ■ External transport to bus terminus, railway station, etc. ■ Bicycle tracks, bicycle stations, bicycle parking areas. ■ Pedestrian pathways along roads; greenways along green landscaped areas.
10. Safety & security	■ Provisions for CCTV cameras. ■ Fencing for the GIP. ■ Security office and security cabins.
11. Gender aspects: provisions for women employees	■ Play schools, Crèche for infant children of the workforce. ■ Ladies toilets, accommodation for late working. ■ Provisions for strengthening of safety and security. ■ Provisions for internal and external transportation. ■ Provisions for health centre, canteens/ food outlets, kiosks, toilets, internal shuttle service (battery operated). ■ An exclusive Women Entrepreneurs Industrial Zone to cater to women entrepreneurs.

12. Other provisions	■ ATM, post office, bank, internet centre ■ Medical facilities, dispensary/health centre ■ Shops for convenience goods ■ Public toilets ■ Water dispensers

F. Green Rating of GIP Jadcherla

A 2-day workshop was conducted for finalization of the Site Master Plan of the Green Industrial Park, Jadcherla (Refer Chapter 1). During the workshop, the GIP Jadcherla site master plan and its management structure (IALA) were reviewed in context of DGNB rating system (Refer Chapter 2).

The DGNB rating system for Industrial Locations is a comprehensive set of indicators that are grouped in 5 main categories and a series of subcategories that are further broken down towards individual indicators. There are over 200 indicators that are all weighted according to their importance.[52]

The experts from DGNB looked at the greening aspects of Jadcherla and categorized them under the DGNB system that has the following main categories:

– ENV: Environmental Quality
– ECO: Economical Quality
– SOC: Sociocultural Quality
– TEC: Technical Quality
– PRO: Process Quality

All above quality parameters have been qualitatively mentioned following:

1. Technical Quality

1. Renewable energy and energy efficiency	■ GIP will have solar energy street lamps. ■ Solar panels on roof tops of factory buildings (Green Factory Buildings) and insulated rooftops ■ Solar energy generation in public/common areas of GIP
2. Quality of transport systems	■ Hierarchy of roads ■ Entry and exit gates with access control ■ Internal and external transportation systems ■ Adequate parking facilities at entry/exist, centralized parking, zone level parking, plot level parking
3. Quality of motorized private transport infrastructure	■ Carpooling will be encouraged. ■ Internal transport from entry gates to discourage private vehicular movement inside GIP.
4. Quality of public transport infrastructure	■ Eco-friendly internal transport – battery operated vehicles. ■ External transport – CNG[53] buses, battery operated vehicles.

52 Buro Happold Engineering, German Sustainable Building Council. (2015). *Blue-Collar Green II Planning of New Industrial Parks & Investment Zones.* Berlin, Germany: Kraubitz T.

53 CNG refers to Compressed Natural Gas

5. Quality of bicycle infrastructure	■ Bicycle tracks, stations and parking ■ Encouragement for bicycling to work
6. Quality of pedestrian infrastructure	■ Extensive safe pedestrian pathways along roads ■ Greenways along green belts and green landscapes
7. Quality of overall logistics concept and others	■ Safety arrangements ■ Fire, disaster risk management ■ Weigh bridges ■ Automobile service stations ■ Shops/stores for materials, spares parts of vehicles etc.
	■ Provisions for social and environmental infrastructure ■ Business centre (one-stop-services), administrative building, information centre, marketing and product exhibition centre, warehouses/raw material depots ■ Training centre, incubation centre, design centre ■ Product/material testing facility ■ Signage ■ Commercial zone
8. Resource-efficient infrastructure	■ Green factory buildings and green buildings ■ Usage of eco-friendly building materials for roads, fencing, buildings, etc. ■ Energy efficient lighting, waste management and wastewater management systems ■ Usage of solar energy

2. Economic Quality

1. Qualitative effects (indirect costs and revenues)	■ Revenues from access control at entry/exit gates ■ Revenues from parking facilities ■ Revenues from leasing of commercial spaces ■ Revenues from plot allotment ■ Revenues from allotment/outsourcing of services ■ Revenues from outsourcing social infrastructure, such as kiosks, canteens, guesthouses, training centres, crèche, etc.
2. Land value development	■ Different category of zones (industrial, commercial, residential, educational) to maximize economic value of the site. ■ Open spaces and green areas are efficiently put to use to serve functions such as micro climate control, aesthetics, and for commercial agriculture. ■ Sale value of allocable land within market rates (<$INR 3600 m^2). ■ Investments targeted to the tune of INR 1,000 cr.

3. Efficient land use	■ Land use break-up in accordance with applicable laws/rules/norms ■ Open spaces and greens efficiently integrated ■ Bicycle tracks and pedestrian ways well integrated with open spaces, roads, and green spaces ■ Landscapes and green belts distributed for environmental function and aesthetics

3. Environmental Quality

1. Efficient waste management	■ Dust bins in public places ■ Vermi-compost plant, handmade paper unit and recycling centre for recycling of wastes ■ Waste management systems ■ Hazardous waste collection and temporary storage
2. Rain water management	■ Storm water drainage ■ Collection of 1hr peak rainfall and treatment to prevent contamination risks ■ Pooling of treated rainwater and integration into landscapes via ponds
3. Changing microclimate	■ Open spaces, landscaped and hierarchical green areas that crisscross the GIP site, integrating with water bodies (of treated rainwater and wastewater) and provide for ventilation and microclimate control
4. Biodiversity	■ Existing plantation and water body on site have been conserved ■ Extensive greenery and plantation will encourage local habitat
5. Emissions and air pollution control	■ GIP will have non-polluting industries ■ GIP will have eco-efficient mobility with battery operated vehicles, CNG buses for internal/external transport, bicycling tacks, and pedestrian pathways that do not cause pollution ■ GIP will have an online air quality monitoring station and display boards
6. Water and soil protection	■ Prevention of hazards to soil, surface/ground water: ■ GIP will have proper storm water management systems, including collection, treatment, and recycle/reuse to prevent pollution/contamination risks to surface/ ground water. ■ GIP will have proper waste water management system- including tertiary treatment for recycle/ reuse, to prevent pollution /contamination risks to soil and surface/ ground water. ■ Biological and chemical water quality: the GIP has an advanced decentralized wastewater treatment systems with tertiary treatment to prevent any bacteriological or chemical contamination. ■ Water structures and quality: All wastewater and storm water will be collected through proper conveyance systems and linked tanks, before subjecting to treatment. ■ Online monitoring systems will be provided to ensure water quality. ■ GIP will have online monitoring systems to check pollution threats.

4. Socio-Cultural and Functional Quality

1. Social quality and infrastructure	■ Training centre to cater to vocational training, university for education, incubator for entrepreneurship promotion ■ Health care facilities ■ Public toilets, drinking water facilities ■ ATM, post office/courier service, bank ■ Information centre for customer services ■ Guest house, dormitories for employees/workers/visitors ■ Food and beverages ■ Recreational facilities ■ Residential township in the vicinity ■ Special arrangements for truck drivers ■ Transportation/mobility arrangements ■ Safety & security
2. Gender considerations	■ Special provisions for women employees, including play schools and crèche for infant children of workers, ladies toilets, and accommodation for late working hours ■ Safety and security, internal and external transportation ■ Health centre, canteens/ food outlets, kiosks, toilets, internal shuttle service (battery operated) ■ An exclusive women entrepreneurs industrial zone to cater to women entrepreneurs
3. Health, comfort and user satisfaction	■ Health centre ■ GIP has recreational areas, such as sports fields, a landmark area, greenery, parks etc. ■ GIP has safety provisions, including security at entry/exits, access control, fencing, CC cameras across the site, and a police post ■ GIP has a landmark area at the centre with extensive landscaped area, amphitheater, theaters, etc. that provide ample opportunities for social interaction. ■ GIP will have signature architecture for the landmark area and entry/exists; elegantly designed green factory buildings and landscaped areas that provides visual identify.
4. Functional and design quality	■ Signature architecture identify and visual impact ■ Mobility integrated with existing transport/mobility network ■ Master Plan aligned with slopes/contours ■ Art in the design – traffic islands, landscaped areas at the entry/exist gates etc.

5. Administrative and Management Quality

1. Overall Management	■ Industrial Area Local Authority (IALA) will be constituted of elected representatives from industries to manage GIP. ■ An environmental sub-committee of the IALA will look into environmental matters.
2. Site development	■ Site development will be undertaken by APIIC through a tendering process. Wherever feasible, viable models such as PPP will be deployed.
3. Services	■ Services such as waste management and wastewater management will be tendered out based on appropriate business models (BOOT[54] etc.) following green procurement principles. ■ Services such as manning entry/exits, security etc. will be outsourced. ■ Infrastructure such as weigh-bridge, warehouses, commercial areas, parking areas will be leased out through a tender process.
4. Plot allotment	■ Plot allotment will be undertaken by APIIC in consultation with IALA. Only those uses that are suitable will be allowed in each industrial zone. ■ While allotting plots, conditions should be clearly laid out and agreements made with plot allottees on adherence to green building norms, rainwater harvesting, etc. for which "plot allotment guidelines" will be prepared by the APIIC. ■ Plots should not be allotted to those industries that will not utilize the common infrastructure and services in GIP, as otherwise the common infrastructure and services will become unviable.
5. Costing	■ The costs of development will be calculated based on essential infrastructure to be developed on the site by APIIC including roads, lighting, drainage, sewerage, greenery, entry/exit gates, buffer zones, rainwater harvesting, waste management, etc. ■ Costs towards common services would be payable by the allottees as per respective business cases.

Following were the conclusions drawn out of the pre-assessment of GIP Jadcherla with respect to the DGNB rating system:

- The proximity to the railway network could become a strong asset for attracting business and to have an alternative for cargo.
- GIP benefits from the already an operational SEZ as a pioneer in the centre of the park.
- Having a university included GIP has the potential for a liveable industrial district that offers opportunities for a diverse set of jobs and education profiles.
- Properly sized common facilities and truck parking will be beneficial to workers and visitors alike, consolidating functions and preventing congestion.
- Sufficient water supply is not in sight and thus recharging the groundwater level and reducing water demand is key for the success of the park.
- By combining international best practice with existing national strategies, it is possible to create a holistic, successful, green industrial park.

54 BOOT refers to Build –own- operate and transfer.

In nutshell, the preliminary assessment of the Site Master Plan showed that the site covered several aspects of the DGNB rating system. Provided that the baseline for a certification is met, a total of **69.3%** and a **Silver** level rating could be achieved.(refer image no. The project has a potential for achieving **international certification of 'Green Industrial park'**. And so, formal process of DGNB certification could be initiated targeting silver or higher rating. (Refer image no. 4-1).

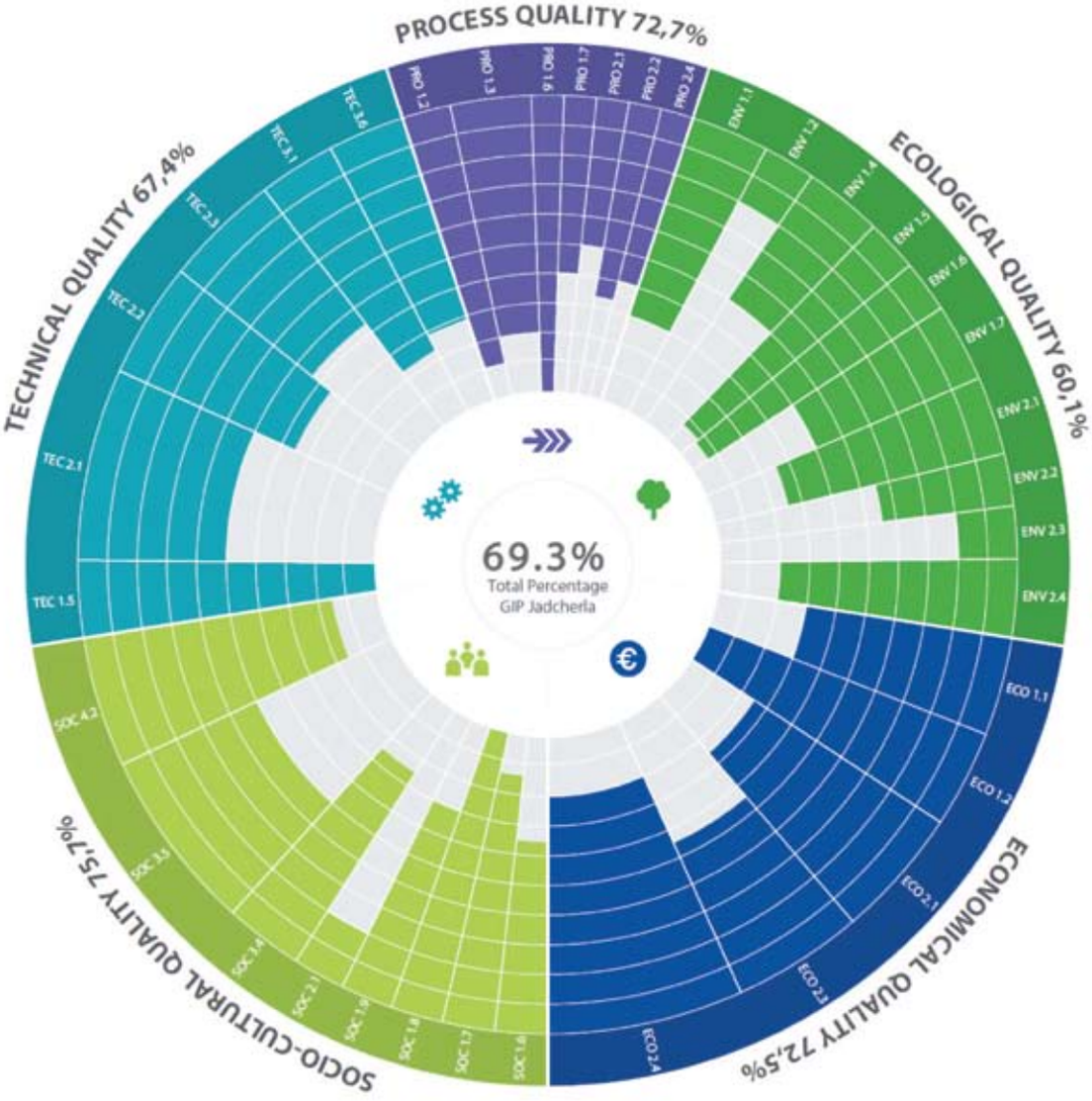


Image no. 4-1: Silver rating potential of GIP Jadcherla (DGNB Pre-assessment)

[Source: Buro Happold Engineering, German Sustainable Building Council. (2015). *Blue-Collar Green II Planning of New Industrial Parks & Investment Zones.* Berlin, Germany: Kraubitz T.]

G. Unique Selling Proposition (USPs) of the Site Master Plan of Green Industrial Park, Jadcherla

Environment Friendly Site Master Plan **To qualify DGNB industrial districts**	**Adequate basic and technical infrastructure**	**Adequate social and environmental infrastructure**
Green Buildings and Green Factory Buildings	**Aesthetically treated to facilitate high visual quality**	**Signature architecture and elegant urban design**
Non-polluting Industries	**Proper wastewater and rain water management, including recycle/reuse**	**Waste management, including recycle/reuse**
Gender sensitive with provisions for women employees and entrepreneurs	**Energy efficiency and renewable energy provisions**	**Eco-efficient transportation and eco-friendly mobility**
Direct employment for about 20,000 people	**Investments to the tune of Rs 1,000 cr**	**Saleable area at less than $40 per sqm**

Over 300 industrial enterprises and about 50 services

Cost effective common infrastructure and services

Industrial park management system (IALA)

Bicycling-to-Work provisions

Pedestrian pathways

Fire, safety, and disaster risk management

Environmental monitoring and public display of relevant environmental data

Dedicated zones and flexible plot sizes

Several revenue options to strengthen industrial park management

Worker and member involvement

Fostering Gender Equality

Vast community facilities

Annexure I

Annex 3-1: Indicative List of Industries Allowed in GIP Jadcherla

1. *Agarbatti* (Incense sticks) and similar products
2. Agricultural equipment manufacturing units
3. Air conditioner parts
4. Aluminium doors / windows / fittings / furniture
5. Assembly and repair of bicycles
6. Assembly and repair of electrical gadgets
7. Assembly and repair of sewing machines
8. Assembly and repair of electronic goods
9. Assembly of coolers
10. *Atta chakki* (flour mill), spices (except chillies)
11. Auto parts (lathe work)
12. Automobile servicing and repairing stations
13. Ball pen refill
14. Barbed wire making
15. Basket making
16. Batic works
17. Belts and buckles
18. Bio-gas
19. Biscuit, cakes, and cookies making
20. Black smithy
21. Bianco cake
22. Block making and photo enlarging
23. Book binding
24. Bread and bakeries
25. Brooms & brushes
26. Bulbs (battery)
27. Button making, fixing of buttons and hooks
28. Candles
29. Cane and bamboo products
30. Canvas bags and hold-all making
31. Canned fruits & vegetables
32. Cardboard boxes
33. Carpentry
34. Cement jellies, cement tanks, manhole covers, and wall rings etc.
35. Chewing gum and *supari* (beetle nut)
36. Clay and modeling
37. Clarified Fruit Juices from pulpy fruits
38. Coir and jute products

39. Cold storage < 10 t capacity
40. Confectionery and bubble gum
41. Copper and brass art wares
42. Cordages, rope, and twine making
43. Cotton ginning
44. Cotton and woolen hosiery (dry processing)
45. Cotton / silk printing (by hand)
46. Crayons
47. Bicycle chain
48. Bicycle locks
49. Dal Dehusking Unit (cottage scale)
50. Dari and carpet weaving
51. Data processing
52. Detergent (without Bhatti - cottage type of industries, only mixing process)
53. Dehydrated fruits
54. Desiccated coconut
55. Diamond cutting and polishing work
56. Elastic products
57. Electric fittings (switch, plug, pin, etc.)
58. Electric motor parts
59. Electric press assembling
60. Electroplating for jewelry and engraving
61. Embroidery
62. Engineering works
63. Fishing net making
64. Fish pickles
65. Fish products: thermal processed
66. Flavours (blending operation)
67. Flour mills (excluding roller mills)
68. Fountain pens, ball pens, and felt pens
69. Framing of pictures and mirrors
70. Fruit processing and preservation - pickles, fruit crushers etc.
71. Fruit and vegetable preserves and candies
72. Fruit jam, jellies, and marmalades
73. Fruit squashes and syrups
74. Fruit toffees
75. Garment making (no bleaching or dyeing)
76. Gold and silver threads
77. Groundnut decorticating

78. Handloom weaving
79. Hangers
80. Hats, caps, including turban embroidery
81. Hosiery products (without dyeing and bleaching)
82. Honey-based beverages
83. Ice boxes and body of the coolers
84. Ice creams, ice candy
85. Instant pickles
86. Iron grills and door making
87. Jam, jellies, and fruits preserves
88. Jewelry items
89. Key rings
90. Khadi and handloom
91. Knife making
92. Kulfi and confectionery
93. Kumkum, kajal, tika, etc.
94. Lace products
95. Lactic beverage: cereal based
96. Laundry and dry cleaning
97. Leather and rexene made ups
98. Leather footwear (does not include any kind of tanning)
99. Manjan and hair oil
100. Manufacture of mineral water
101. Manufacture of tooth paste, tooth powder, shampoo, nail polish, hair oil by mixing process
102. Manufacture of biddies (laser cigarettes)
103. Manufacture of made-up textiles goods such as curtains, mosquito nets, mattress bedding material, pillow covers and bags etc.
104. Manufacture of metal building components such as grills, gates, door and window frames, water tanks, wire net, etc. (use of coal is not permitted)
105. Manufacture of milk products such as butter, ghee, etc.
106. Manufacture of mirrors and photo frames
107. Manufacture of musical instruments
108. Manufacture of paper and card board products (pulp and paper manufacturing. excluded)
109. Manufacturing of ice-cream
110. Manufacturing of ink for fountain pens (formulation only)
111. Manufacturing of office and household furniture and appliances: steel and wood
112. Manufacturing of optical frames
113. Manufacturing of scientific and mathematical instruments (Engineering. works & Assembly).
114. Manufacturing of surgical gauges and bandages
115. Manufacturing of writing instruments (pens, pencils, etc.)

116. Mushrooms: production and preservation
117. Marble stone items
118. Mattress and pillows without blowing process
119. Metal lathe cutting
120. Mini Rice Mill
121. Motor winding works
122. Musical instruments (including repairs)
123. Nails, screws, rolling shutters (from finished material)
124. Name plate making
125. Oil ginning and expelling (no hydrogenation and no refining)
126. Packing boxes for shirts etc.
127. Pan *masala* (Mouth freshner)
128. Papad (Papadam) making
129. Paper bags
130. Paper stationery items and book binding
131. Parboiled paddy (dry heat method)
132. Peanut *Chikki* (type of indian sweet)
133. Pencil and pen manufacturing units
134. Photographs, printings (including sign board painting)
135. Photosetting
136. Photostat and cyclostyling
137. Pickles and *chutneys* (sauce)
138. Garland of flowers
139. Processing of condiments, spices, groundnuts, and dal, etc.
140. Pulse mills
141. *Rakhee* (decorated threads) making
142. Ready-made garments and apparel making (dry processing)
143. Repairs of watches and clocks
144. Rice flakes
145. Rubber stamps
146. *Saree* (South Asian female garment) fall making
147. Saw mills
148. Scissors making
149. Screen printing
150. Screw and nails
151. Shoe laces
152. Silver foil making
153. Small electronic components
154. Soap making (only mixing process)

155. Soft drink making (not excluding 500 bottles per day)
156. Spectacles and optical frames
157. Spice (Masala) powders
158. Sports goods
159. Stamp pads
160. Stationery articles (except manufacturing of paper and inks)
161. Steel furniture
162. Stone engraving
163. Stone, marble, granite cutting, polishing, and finishing
164. Stove pipe, alpine and safety pins, aluminum buttons, (by hand process)
165. Surgical bandages rolling and cutting
166. Surgical instruments and equipment
167. Table lamps and shades
168. Tailoring
169. Textile weaving
170. Thread balls and cotton fillings
171. Tin boxes and makings
172. Toys and dolls
173. Turmeric, salt, and spice grinding units
174. Typewriter parts, manufacturing, and assemblage
175. Tyre retreating
176. Umbrella assembly
177. Velvet embroidered shoes/shawls
178. Vermicelli and macaroni
179. Village oil ghani
180. Village pottery industry (without bhatti)
181. Water meters repairing
182. Water tanks
183. Welding works
184. Wet grinding
185. Wood carving and decorative wood wares
186. Wooden furniture works
187. Wool balling and lachhee making
188. Wool knitting (with machine)
189. Xerox and photocopying
190. *Zari* (fine thread or gold or silver) making

Annex 3-2: Indicative List of Industries Restricted in GIP Jadcherla

S. No.	Industries
1.	Thermal Power Plants – Coal based ≥ 200/210 MW
2.	Thermal Power Plants – Coal based < 200/210 MW
3.	Thermal Power Plants – gas based
4.	Thermal Power Plants – LDO based
5.	Oil Refinery, Petroleum Refining
6.	Petrochemicals
7.	Integrated Iron and Steel
8.	Fertilizer
9.	Copper Smelter
10.	Zinc Smelter
11.	Aluminum Smelter
12.	Lead Smelting
13.	Cement – large
14.	Cement – medium
15.	Cement – small/tiny
16.	Pesticides – Technical grades
17.	Pharmaceuticals – bulk drug
18.	Nitric Acid
19.	Sulphuric Acid
20.	Phosphoric Acid
21.	Caustic Soda a) Mercury cell b) Membrane cell
22.	Dye and Dye Intermediates
23.	Sugar
24.	Organic Chemicals
25.	Re-Heating Reverberatory Furnace, Capacity: large
26.	Foundries, Cupola, Arc Furnace, Induction Furnaces – large
27.	Paint (excluding formulation)
28.	Inorganic Chemicals
29.	Man-Made Fibres (Synthetic; Semi Synthetic)
30.	Boilers More than 15 t/hr
31.	Composite Woolen Mills - Chromium and Sulphide

S. No.	Industries
32.	Glass - Soda lime, Borosilicate, and other special glasses (other than Lead) Furnace capacity - Product draw capacity more than 60 tpd
33.	Glass - Lead Glass: Furnaces of all Capacity
34.	Wood and wood products a) Ply wood manufacturing b) Fibre board manufacturing c) Furniture
35.	Leather Tannery a) Chrome Tanneries / Combined Chrome and Vegetable Tanneries b) Vegetable Tanneries
36.	Pulp and Paper a) Agro Based b) Waste Paper Based c) Paper Board without cooking operation
37.	Composite Woolen Mills - Common
38.	Fermentation (Maltries and Breweries)
39.	Asbestos manufacturing – medium/large (Including all process involving the use of Asbestos)
40.	Boilers Less than 2 t/hr 2 to 5 t/hr
41.	Slaughter House, Meat and Sea Food Industry - Slaughter House - all capacities
42.	Food and Fruit Processing a) Soft Drinks b) Fruit Based Synthetic(More than 0.4 tpd) c) Bottle and Tetra pack d) Synthetic (Less than 0.4 tpd)
43.	Food and Fruit Processing - Fruit and Vegetables
44.	Food and Fruit Processing – Bakery
45.	Food and Fruit Processing a) Bread and Biscuit, Continuous Process (More than 20tpd); Non Continuous Process (Less than 20tpd) b) Biscuit Production - all capacities
46.	Food and Fruit Processing - Confectioneries > 4 tpd Below 4 tpd
47.	Distillery (Alcohol distillery)
48.	Pesticides – formulation
49.	Pharmaceuticals – formulation
50.	Cotton Textile Industries
51.	Electroplating

S. No.	Industries
52.	Stone Crushing
53.	Coke Oven
54.	Synthetic Rubber
55.	Calcium Carbide
56.	Black Carbon
57.	Natural Rubber
58.	Re-Heating (Reverberatory) Furnace, Capacity: small/medium
59.	Foundries, Cupola, Arc Furnace, Induction Furnaces – small/medium
60.	Lime Kiln
61.	Jute Processing
62.	Dairy
63.	Ceramic Industry
64.	Starch and Glucose
65.	a) Pottery and Earthen Ware b) SSI and Using Furnace oil
66.	Soap (Detergent Formulation)
67.	Bone mills and allied industries

Annex 3-3: Parking Standards

Table no. 1: Carrying capacity of trucks

S. No.	Mode	Carrying capacity in tonnes
1	2 Axle trucks	16
2	3 Axle trucks	25
3	MAV	31

Note: *PCU stands for Passenger car unit is a metric used in Transportation Engineering to assess traffic-flow rate on a road

Source: Notification for the specification of Maximum Gross vehicle weight and the minimum safe axle weight, Ministry of road transport and highways (MORTH), GOI

Table no. 2: Parking space standards

S. No.	Mode	Length (m)	Width (m)	Minimum parking space required (m^2)
1	Car	2.5	5	25
2	2 wheeler	2.2	0.7	4
3	Taxi	_	_	25
4	Auto rickshaw	_	_	5
5	Cycle	_	_	1.2
6	Trucks	3.75	7.5	28
7	2-3 axle truck	_	_	62
8	Multi axle trucks	_	_	165

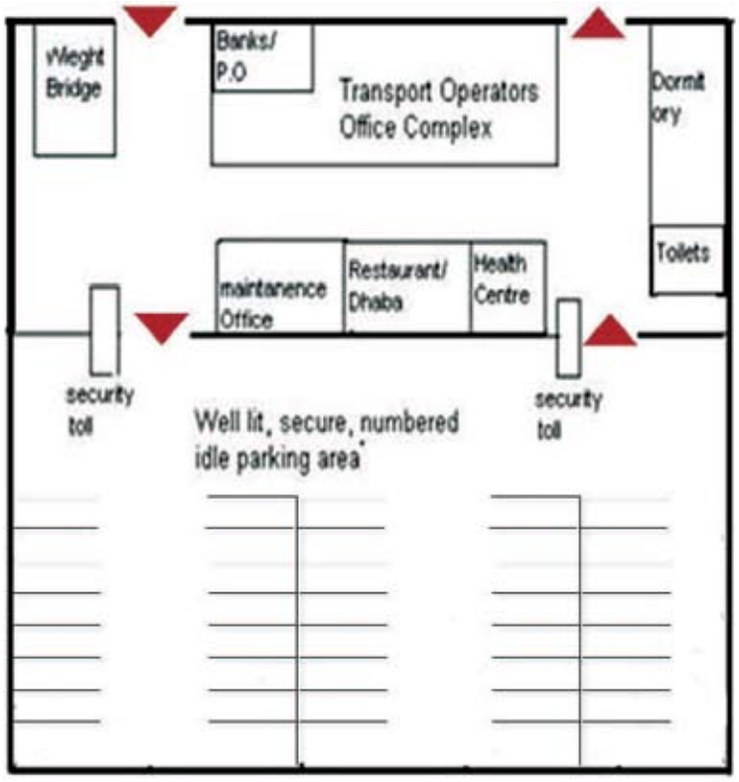
Source: Ministry of Urban Development, Government of India (2015). *Urban and Regional Development Plans Formulation and Implementation Guidelines.* New Delhi, India.

Table no. 3: Parking efficiency

S. No.	Parking angle (degrees)	Maximum Parking Produced (%)
1	90	67
2	75	23
3	60	8
4	45	2
5	30	0

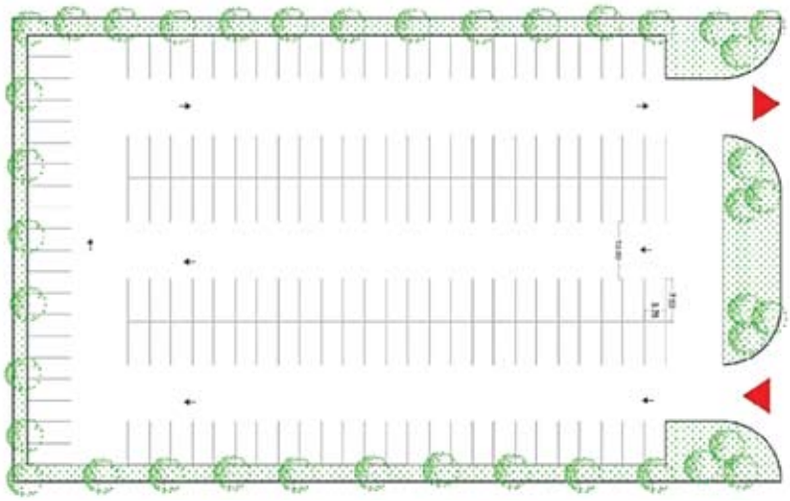
Source: Chodash I.L. (1986). *Relative efficiencies of various parking angles* (ITE journal of Transportation engineers). Washington, USA. Retrieved from http://www.ite.org/membersonly/itejournal/pdf/jca86a34.pdf

Annex 3-4: Central Truck Parking



Conceptual plan of central level parking facility

[Source: IIM Bombay. (2011). *Restructuring the truck terminal infrastructure in Karnataka.* Bombay, Maharashtra: Tara S.N. Retrieved from http://tejas.iimb.ac.in/articles/85.php]

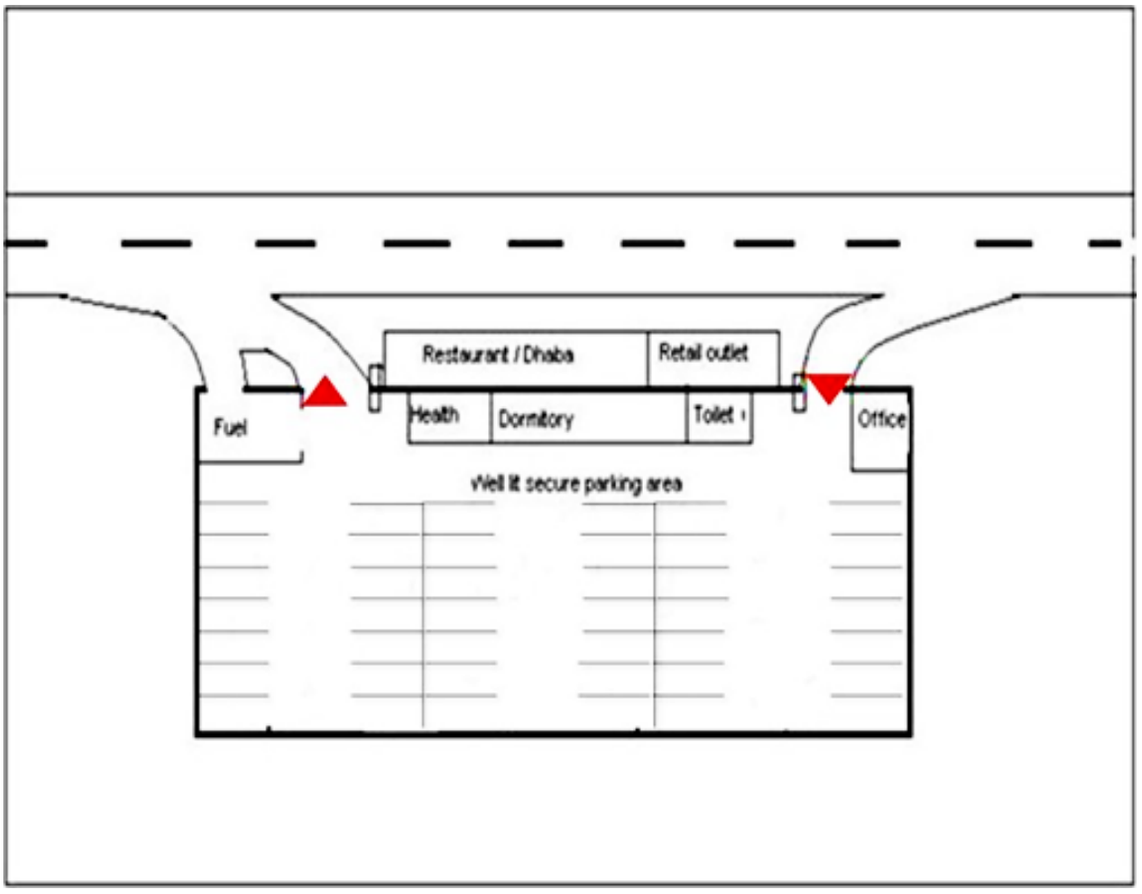


Parking module of 170 trucks at centre

[Source: GIZ-IGEP]

Size of bay	3.75 m x 7.50 m
Parking capacity	170 trucks
Green area	1604 m^2
Plot area	10384 m^2

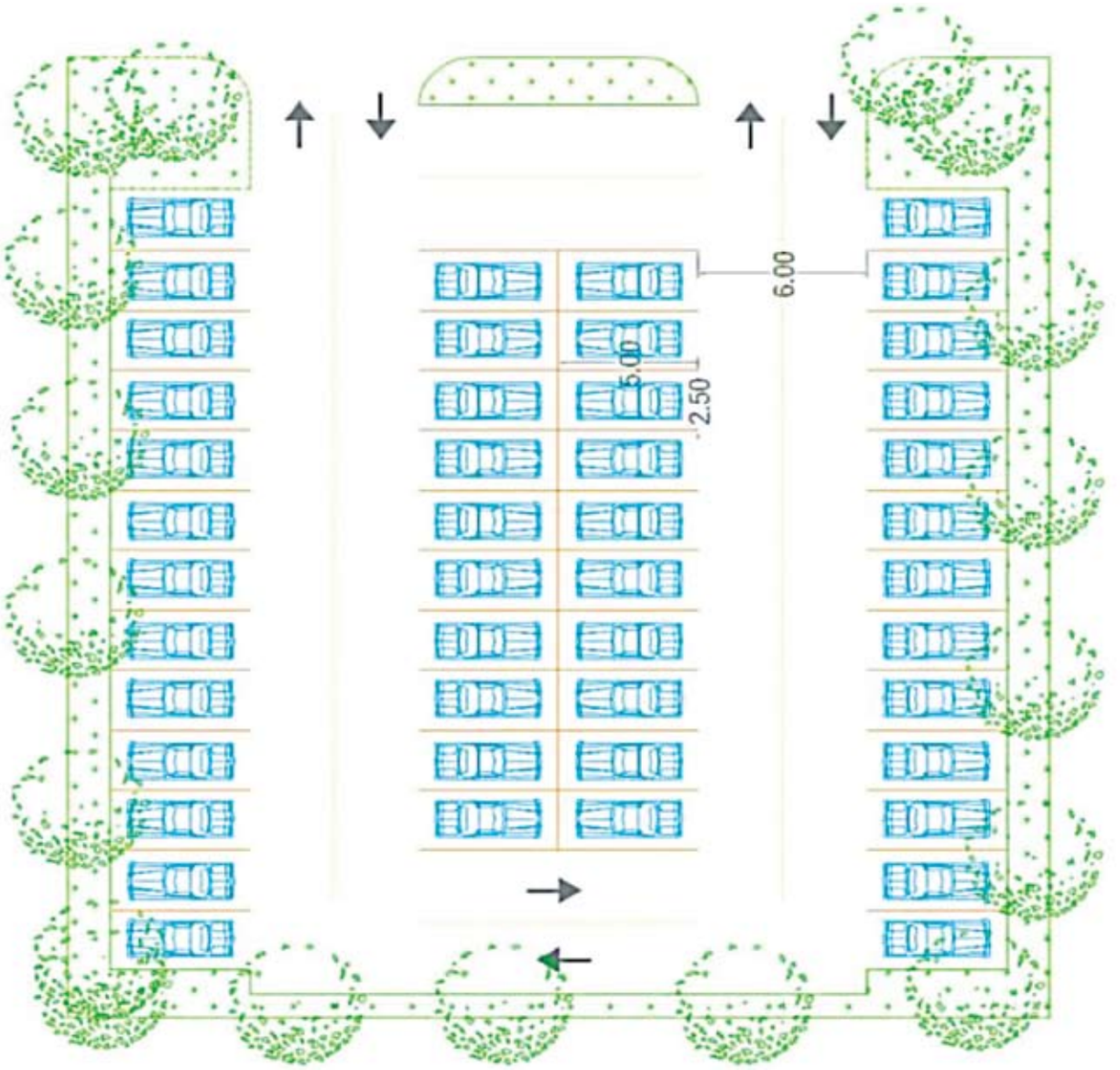
Annex 3-5: Transit Truck Parking



Conceptual plan of transit truck parking facility

[Source: IIM Bombay.(2011). *Restructuring the truck terminal infrastructure in Karnataka.* Bombay, Maharashtra: Tara S.N. Retrieved from http://tejas.iimb.ac.in/articles/85.php]

Annex 3-6: Car Parking



Conceptual plan of zonal car parking facility

Size of bay	2.50 m x 5.00 m
Parking capacity	46 cars
Green area	245 sq.
Plot area	1400 m^2

[Source: GIZ-IGEP)

Annex 3-7: Automobile Service Station

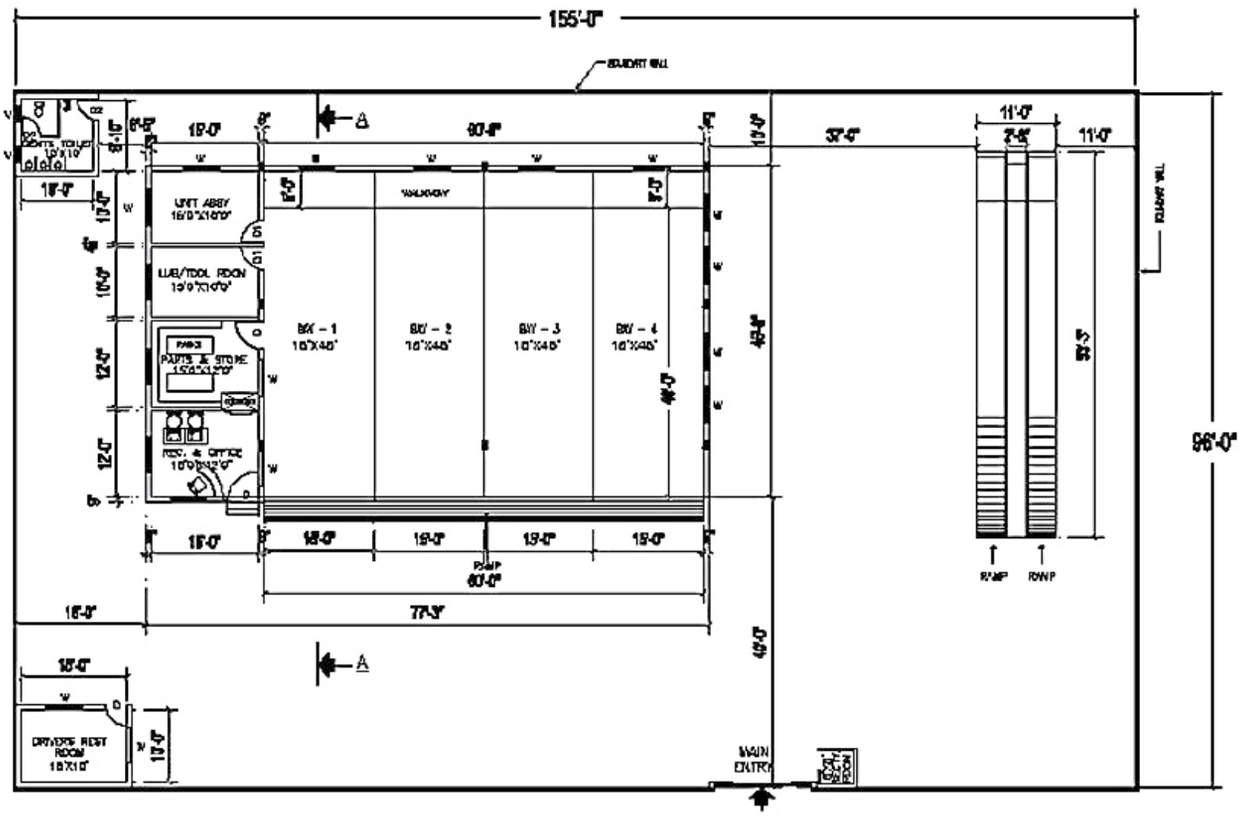
Table no. 1: Components at Service Station

S. No.	Facility	8 bay (units in ft^2)	8 bay (units in m^2)
	Total Constructed area	**12455**	**1120.95**
	Open Area	**11380**	**1024.2**
	Total Land area	**23835**	**2145.15**
1	**Customer Interaction Area**		
a	Reception	50	4.5
b	Service counters/Service Advisor	150	13.5
c	Customer Lounge	200	18
d	Cash Counter	50	4.5
e	Spare Parts Counter	50	4.5
	Sub Total	**500**	**45**
2	**Service support - Office**		0
a	Works Manager	100	9
b	Warranty Support	100	9
c	Worker's Changing Room	200	18
d	Employee Dining Area	200	18
e	Training/Conference Room	200	18
f	Managing Director's Cabin	800	72
	Sub Total	**1600**	**144**
3	**Workshop**		
a	Mechanical Bays	5400	486
b	Body repair Bays	1350	121.5
c	Washing Bay	825	74.25
d	Spare Parts Storage Area	1000	90
	Sub Total	8575	771.75
4	**Utility Rooms**		
a	Electrical Room	80	7.2
b	Aggregate O/H	150	13.5
c	Warranty Room	100	9
d	Tools Room	100	9
e	Lube Room (Fresh Oil)	100	9

f	Tyre Removal Area	100	9
g	Minor Machine Shop	150	13.5
h	Pantry	50	4.5
i	Drivers Rest Room	250	22.5
j	Compressor Room	300	27
k	Generator Room		
l	Scrap Area	300	27
m	Security Room	50	4.5
n	Used oil Disposal area	50	4.5
	Sub Total	1780	160.2
5	Open Area		
	Drive-through Area	30 feet throughout	
	Customer vehicle parking	As required	
	Staff Vehicle Parking	500	45
	Ready vehicle/vehicle waiting for repairs parking area	10800	972

Source: A sample design of a service centre of one of the major market players in the truck industry of India

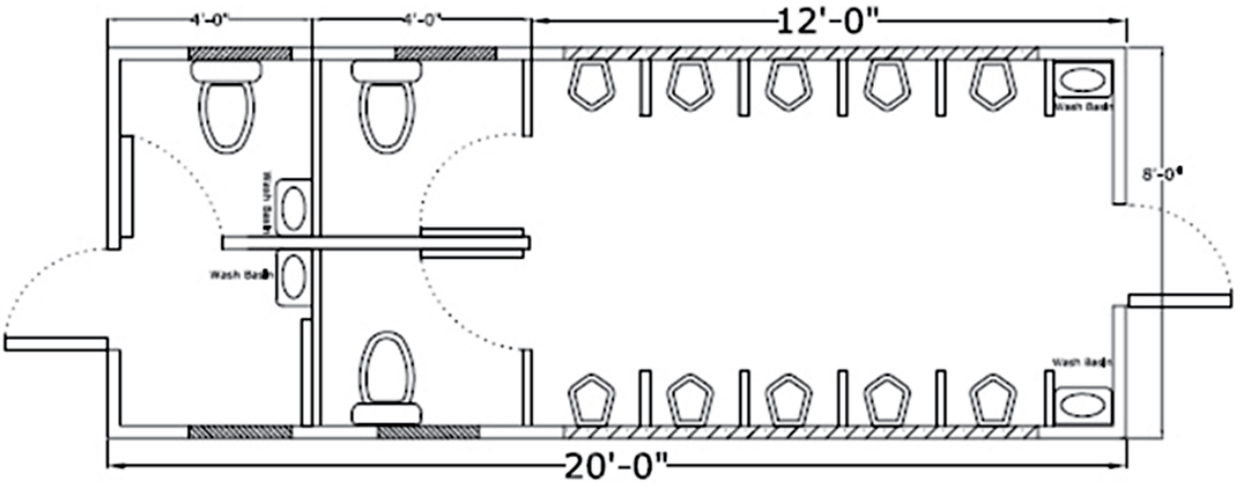
Total area required for 2 service centres = 4,290 m^2



Sample layout of service centre for trucks

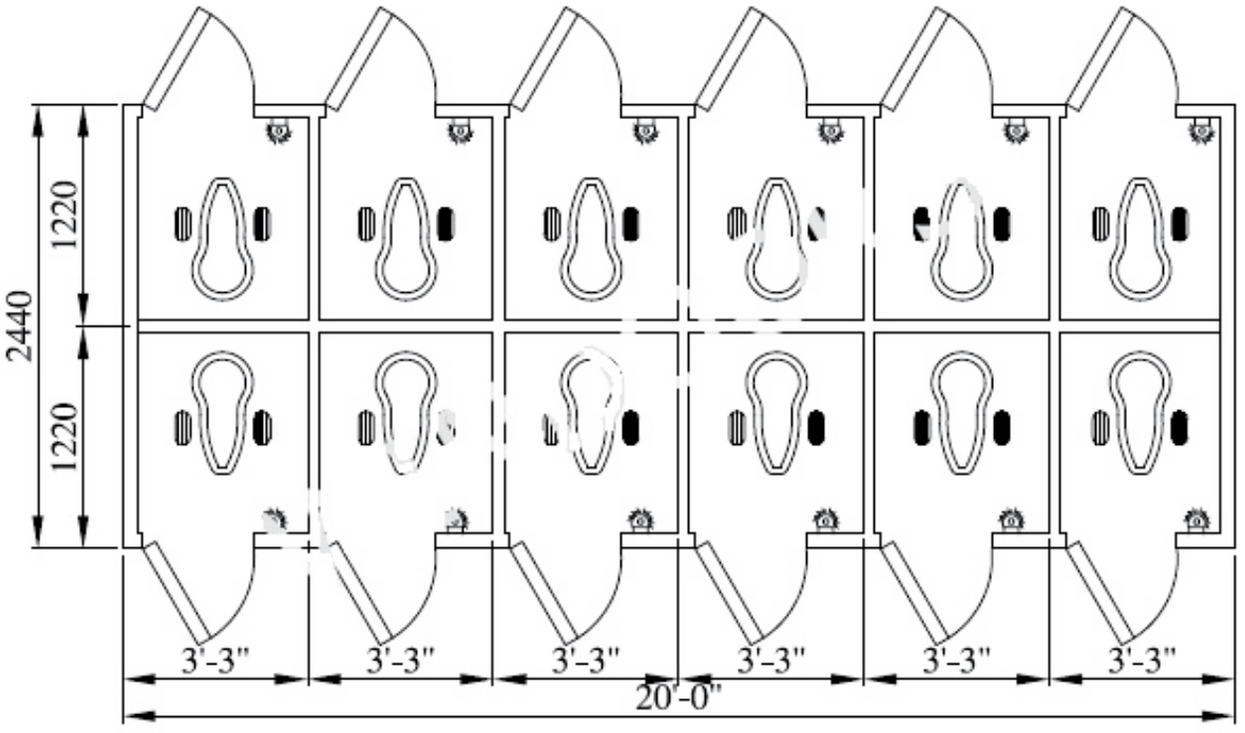
[Source: A sample design of a service centre of one of the major market players in the truck industry of India]

Annex 3-8: Toilets



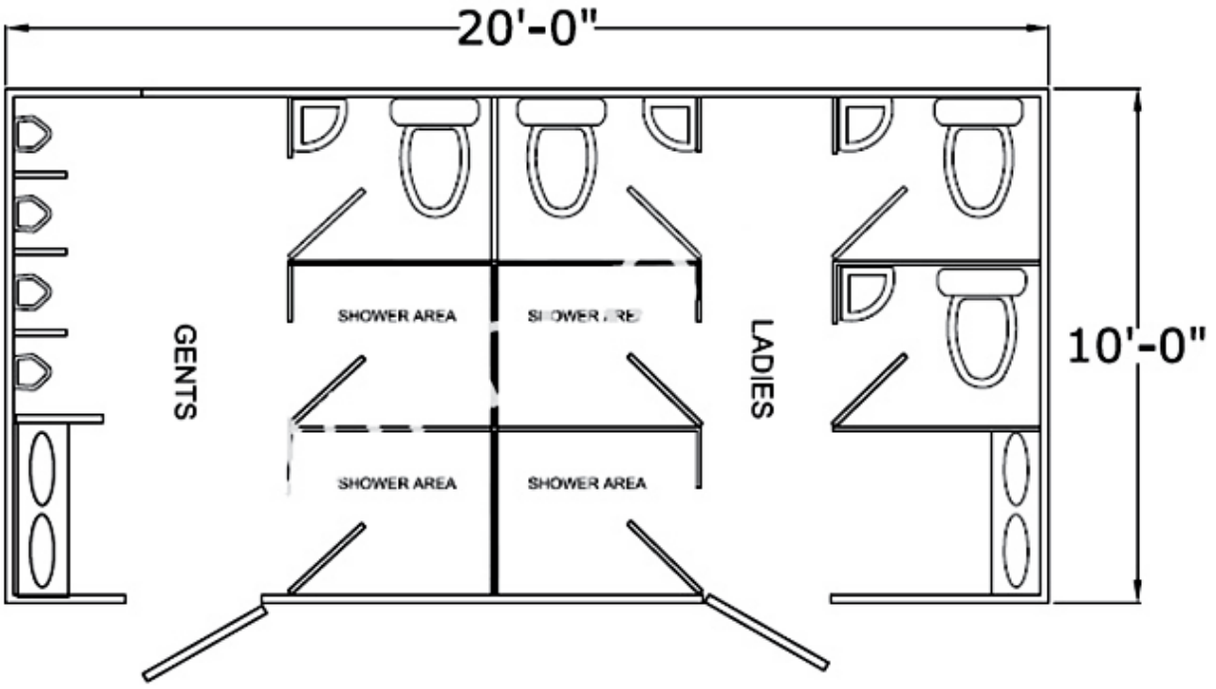
Sample plan of public toilet – Type 1

[Source: Layouts for Toilets, Windoors International Limited (2011). Retrieved from http://www.windoors-india.comlayouts_toilet.htm]



Sample plan of public toilet – Type 2

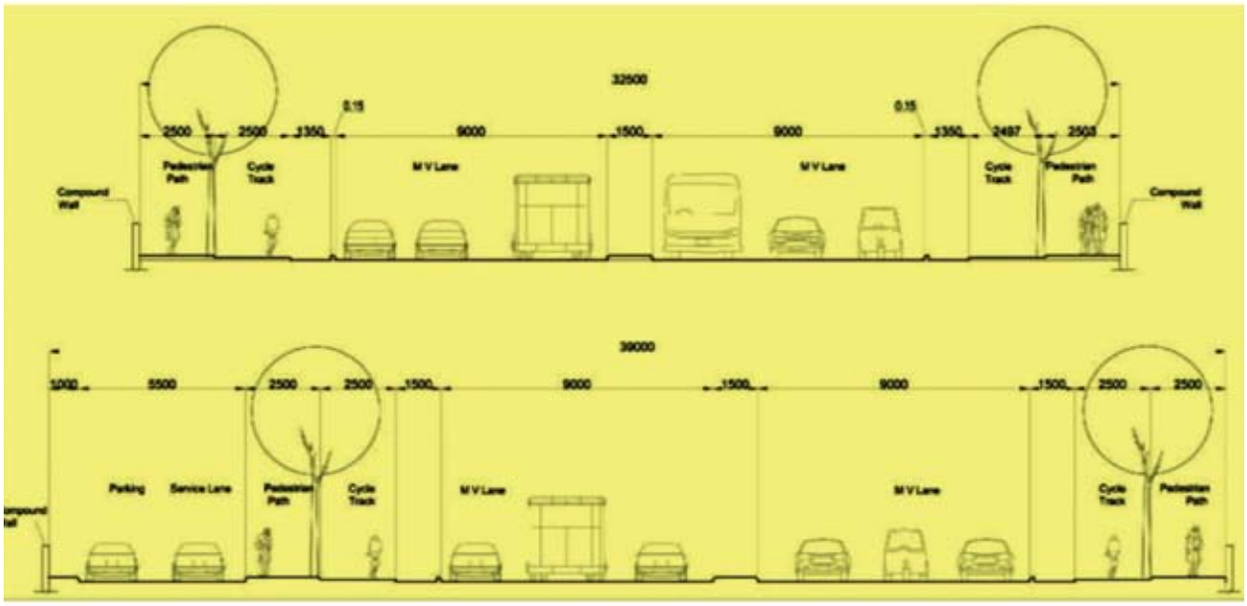
[Source: Layouts for Toilets, Windoors International Limited (2011). Retrieved from http://www.windoors-india.comlayouts_toilet.htm]

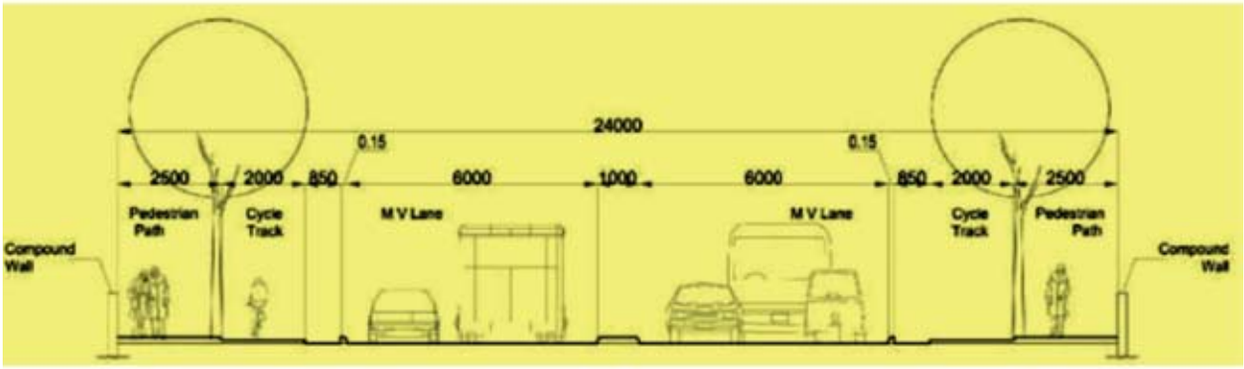


Sample plan of public toilet – Type 3

[Source: Layouts for Toilets, Windoors International Limited (2011). Retrieved from http://www.windoors-india.comlayouts_toilet.htm]

Annex 3-9: URDPFI Road Cross-sections

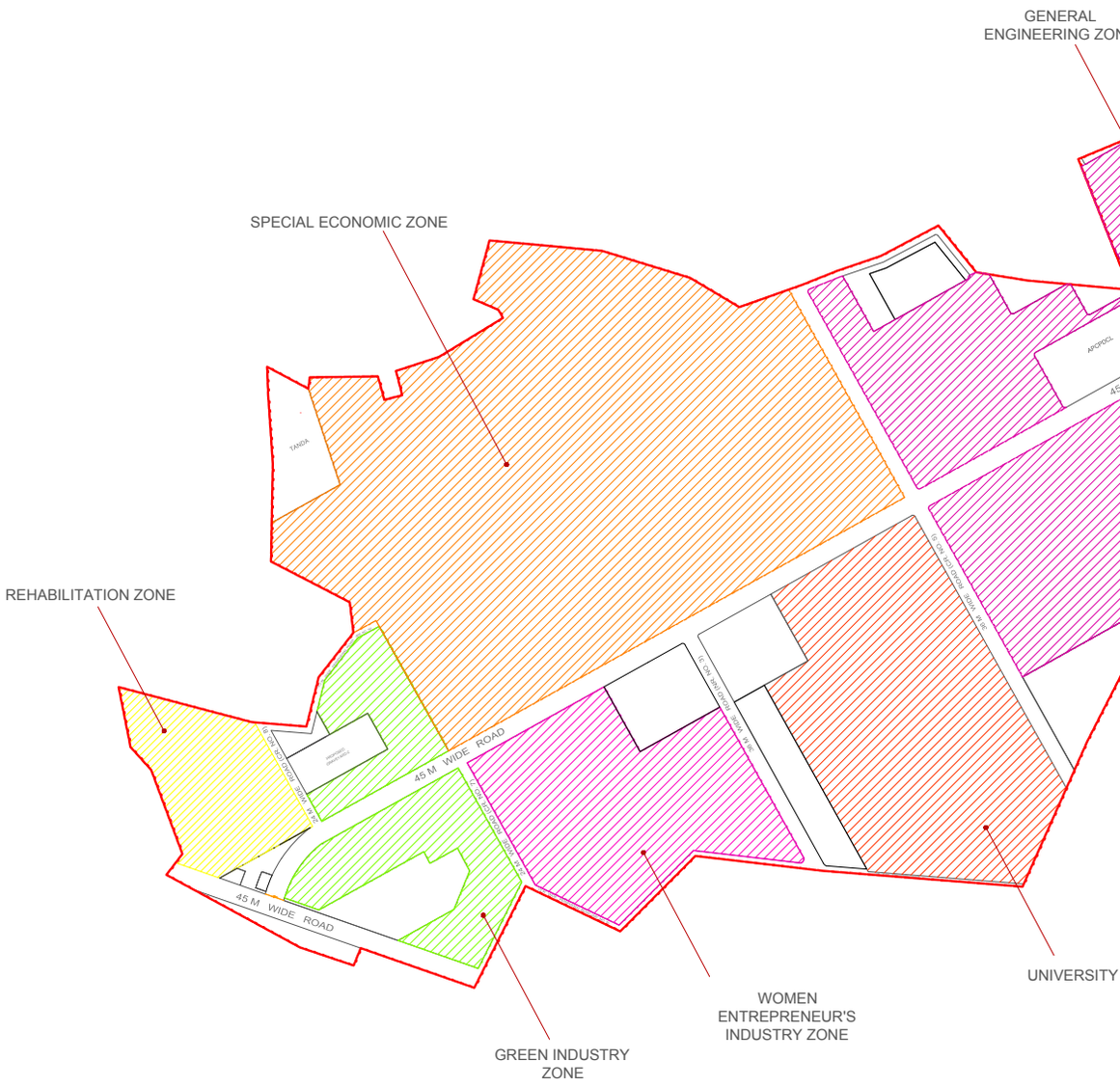




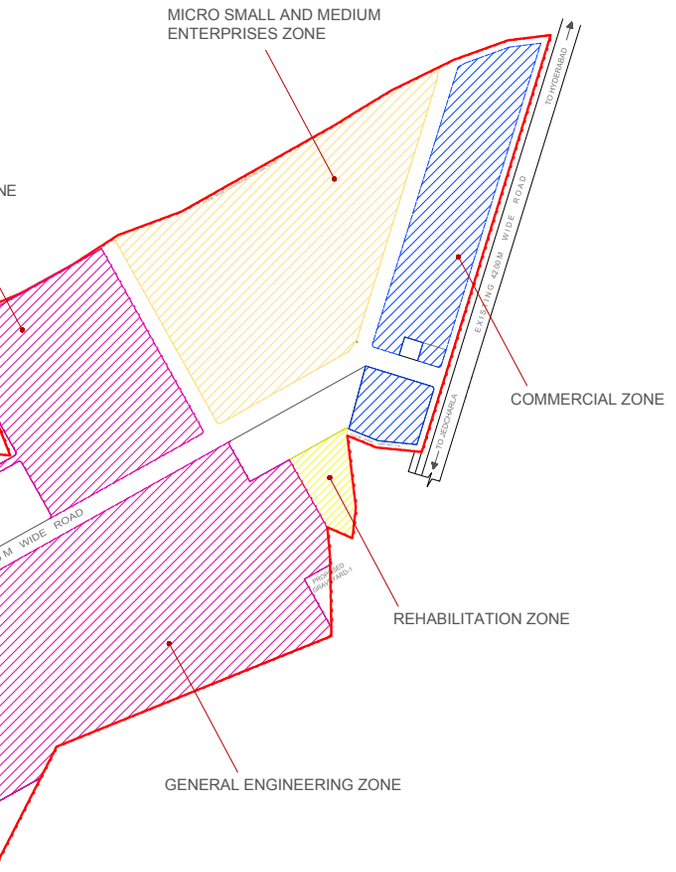
[Source: Ministry of Urban Development, Government of India (2015). *Urban and Regional Development Plans Formulation and Implementation Guidelines.* New Delhi, India]

Annexure II (Maps)

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT



2 , 418 TO 435, 437 TO 445, 452 TO 459 OF JAPUR VILLAGE , BALANAGAR MANDAL,



ZONING PLAN

LEGEND

- SITE BOUNDARY
- ZONE 1 : SPECIAL ECONOMIC ZONE
- ZONE 2 : GENERAL ENGINEERING ZONE
- ZONE 3 : MICRO , SMALL AND MEDIUM INDUSTRY ZONE
- ZONE 4 : GREEN INDUSTRY ZONE
- ZONE 5 : WOMEN ENTREPRENEUR'S INDUSTRY ZONE
- ZONE 6 : COMMERCIAL ZONE
- ZONE 7 : UNIVERSITY ZONE
- ZONE 8 : REHABILITATION ZONE

AREA UNDER ZONES

ZONE 1: SPECIAL ECONOMIC ZONE	=	240.60 acres
ZONE 2: GENERAL ENGINEERING	=	211.91 acres
ZONE 3: MICRO MEDIUM AND SMALL ENTERPRISES (MSME) ZONE	=	65.96 acres
ZONE 4: GREEN INDUSTRY ZONE	=	41.21 acres
ZONE 5: WOMEN ENTREPRENEURS INDUSTRY ZONE	=	56.94 acres
ZONE 6: COMMERCIAL ZONE	=	33.20 acres
ZONE 7: UNIVERSITY ZONE	=	89.43 acres
ZONE 8: REHABILITATION ZONE	=	31.90 acres

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

R.F 1:5000

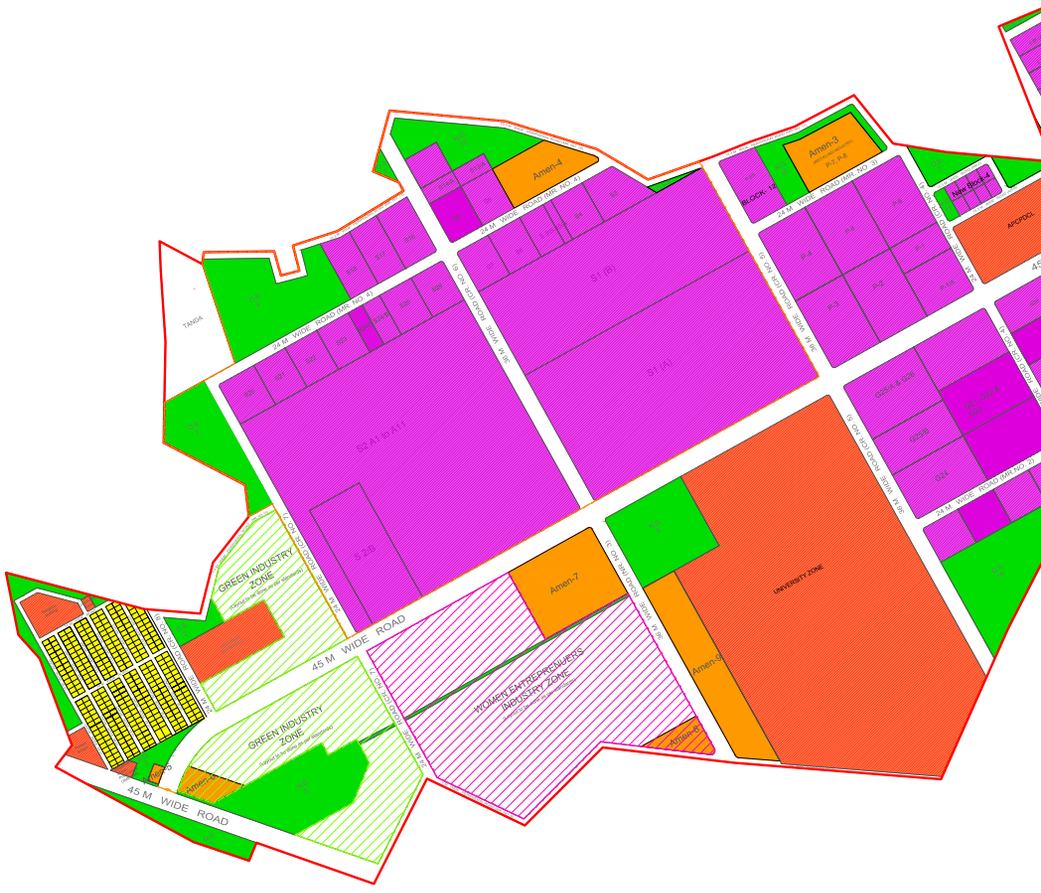
SCALE 100 0 100 200 300 400 500 (in metres)

N

DRAWING NO.	SHEET SIZE	DATE OF PREPARATION	DATE OF REVISION
3-1	A0		

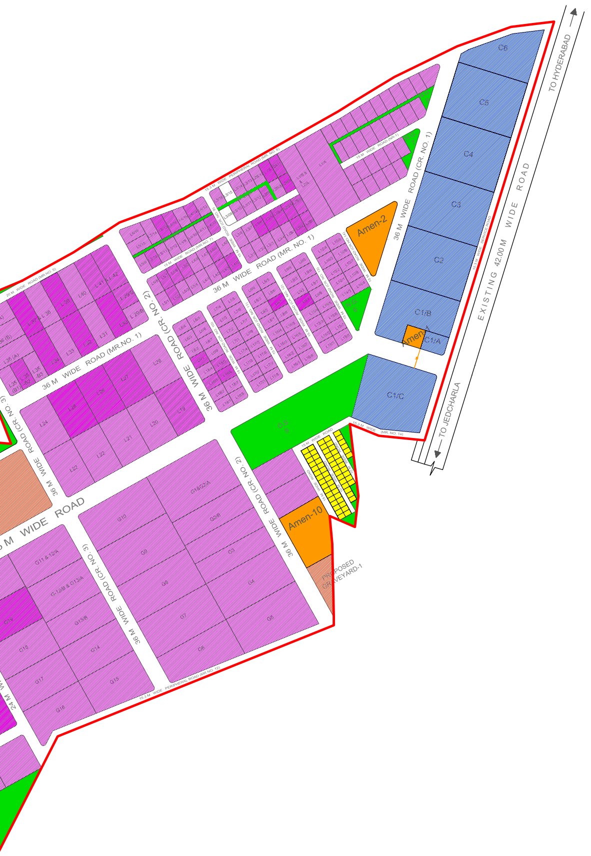
DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT



2 , 418 TO 435, 437 TO 445, 452 TO 459 OF
JAPUR VILLAGE , BALANAGAR MANDAL,

LAND USE



LEGEND

- SITE BOUNDARY
- SEZ BOUNDARY
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- PUBLIC/ SEMI-PUBLIC USE
- PARKS AND WATER BODIES
- MIX USE- FACILITY ZONES
- ZONE 4 : GREEN INDUSTRY
- ZONE 5 : WOMEN ENTRPRENEUR'S INDUSTRY
- ROADS

AREA DISTRIBUTION

TOTAL AREA (AS PER DRAWING)	=	956.58 Acs
REHABILITATION AREA (28.83+ 5.07)	=	31.90 Acs
AREA COVERED FOR GRAVEYARD	=	5.98 Acs
AREA COVERED BY TANDA	=	8.97 Acs
AREA ALLOTTED TO UNIVERSITY	=	89.43 Acs
NET AREA	=	820.30 Acs

PLOTTED AREA (INDUSTRIAL)	=	491.90 Acs (60%)
PLOTTED AREA (COMMERCIAL PLOTS)	=	33.20 Acs (4%)
ROADS AREA	=	164.19 Acs (20%)
OPEN SPACE	=	66.87 Acs (10%)
FACILITY AREA	=	49.25 Acs (6%)

Note:

1. ACS refers to acres which is equal to 4046.76 sqm.
2. Area allotted to SEZ is industrial area by function, Hence added in the net area.
3. All area are as per calculated from actual boundary in the drawing.
4. Area covered under National Highway- 7 widening is not a part of site boundary , hence it can not be subtracted.

LAND USE DISTRIBUTION IN GIP JADCHERLA

S.No.	Land Use	Standard*	Area (in acres as per previous master plan)	Area (in acres as per proposed master plan)
1	Industrial plots (net area)	55%-60%	544.3 (66.4%)	491.9 (60.4%)
2	Recreational Buffer zones, Parks, Water bodies, Green under High tension lines etc.	10%-12%	66.9 (8.2%)	81.8 (10.1%)
3	Commercial Shopping Centre, Petrol Pumps, Guest House/ Budget Hotels, Lodging and Boarding, Service and Repair shops, Communication / Telephone Exchange etc.	2%-3%	28.0 (3.4%)	33.2 (4.0%)
4	Facilities Public and semi – public: Fire Station/ Fire Post, Police Station / Police Post, Hospital / Dispensary, Day Care Centre etc. Utilities: Electric Sub-Station, CETPs, Pumping station, Underground Reservoir / Fire Fighting tanks and other utilities etc.	8-10%	15.3 10.0 } (3.1%)	39.3 10.0 } (6.0%)
5	Transportation Circulation, Loading/Unloading Area, Parking, ideal truck Parking, Goods Vehicle parking etc.	18-20%	155.7 (19.0%)	164.2 (20.0%)
	TOTAL AREA		820.3	820.3

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

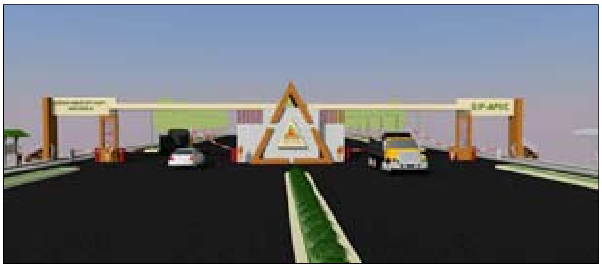
R.F 1:5000

SCALE 100 0 100 200 300 400 500 (in metres)

N

DRAWING NO.	SHEET SIZE	DATE OF PREPARATION	DATE OF REVISION
3-2	A0		
DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY	

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT



ARTISTIC IMPRESSION OF MAIN ENTRANCE

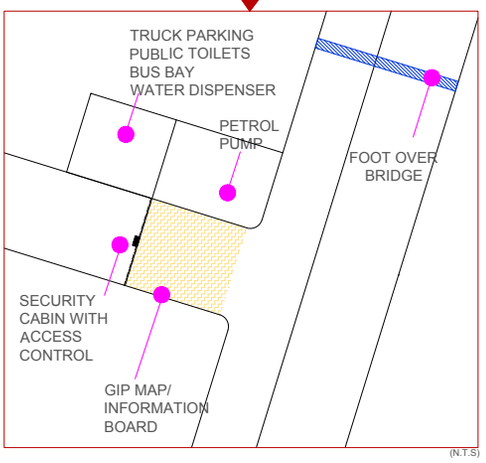
SECOND ENTRANCE ZONE

2 , 418 TO 435, 437 TO 445, 452 TO 459 OF JAPUR VILLAGE , BALANAGAR MANDAL,

BASIC INFRASTRUCTURE: CIRCULATION

LEGEND

- SITE BOUNDARY
- SEZ BOUNDARY
- 45 M R-O-W
- 36 M R-O-W
- 24 M R-0-W
- LESS THAN 24 M R-O-W
- GREEN PATHWAY



MAIN ENTRANCE ZONE

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

R.F 1:5000

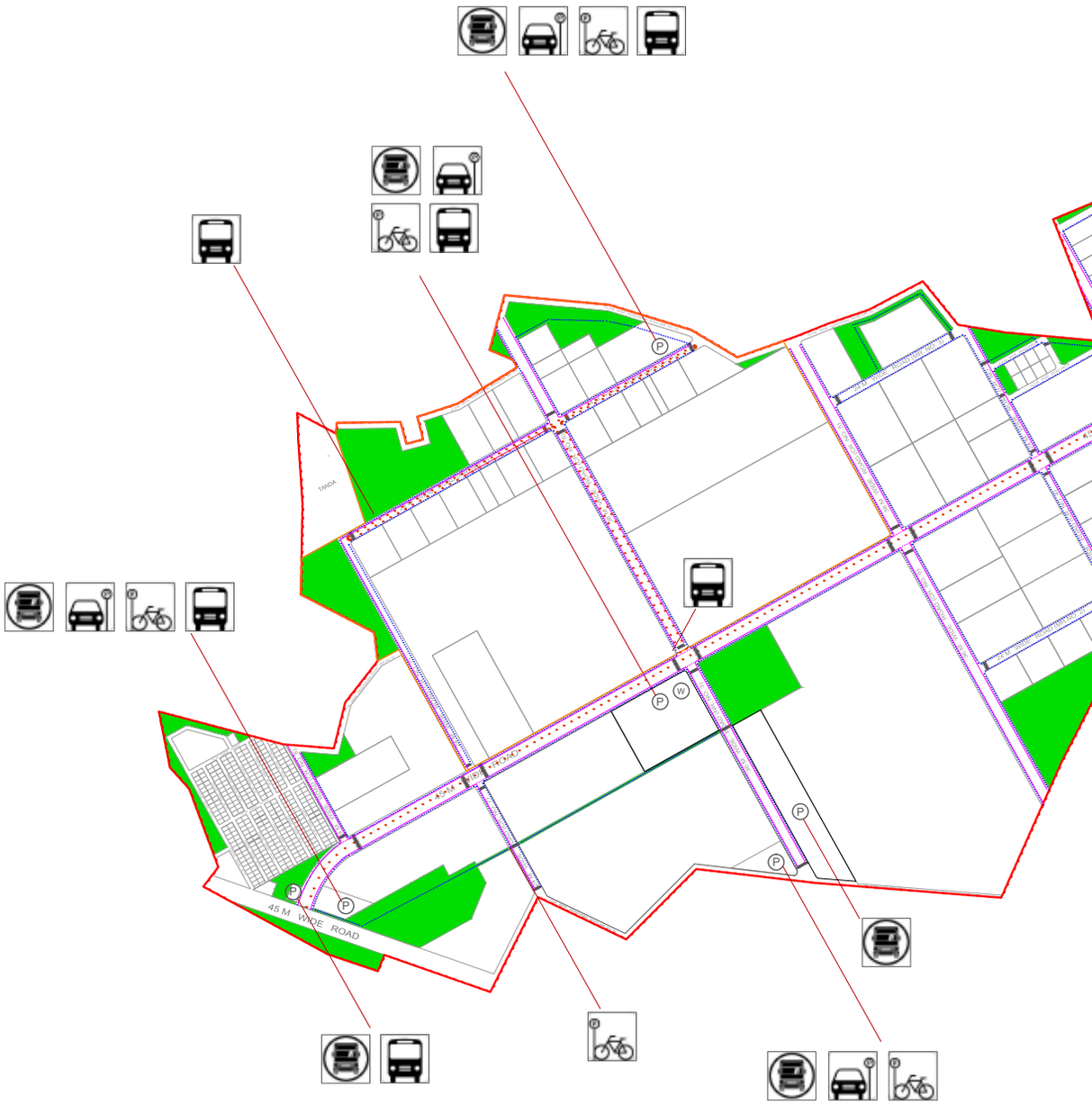
SCALE 100 0 100 200 300 400 500 (in metres)

N

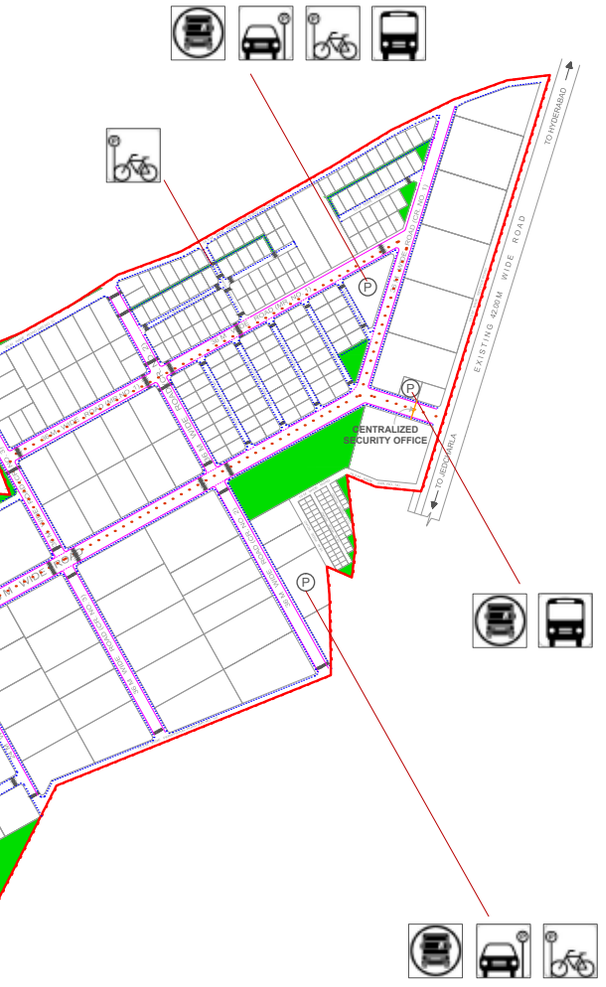
DRAWING NO.	SHEET SIZE	DATE OF PREPARATION	DATE OF REVISION
3-3	A0		

DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT



2 , 418 TO 435, 437 TO 445, 452 TO 459 OF JAPUR VILLAGE , BALANAGAR MANDAL,



BASIC INFRASTRUCTURE
(PUBLIC TRANSPORT AND MOBILITY)

LEGEND

- SITE BOUNDARY
- SEZ BOUNDARY
- PARKS AND GREENWAYS
- PEDESTRIAN PATH
- BICYCLE WAY
- PARKING
- BUS ROUTE (INTERNAL)
- WEIGH BRIDGE
- TRUCK PARKING
- BUS PARKING
- CAR PARKING
- CYCLE PARKING/ RENT-A-CYCLE STAND

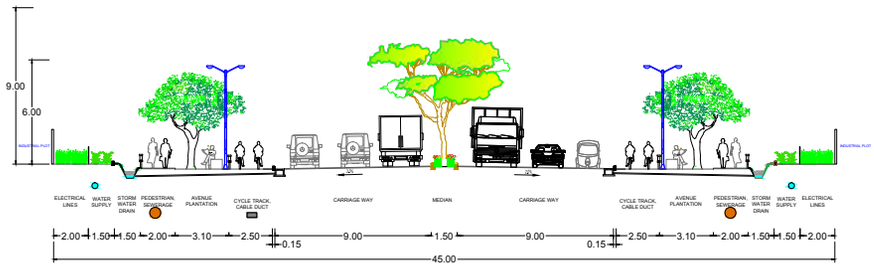
NOTE:

1. PEDESTRIAN PATHS AND CYCLE TRACKS IN THIS MAP ARE ONLY SHOWN TO INDICATE THE ROUTES, THEY MAY NOT BE REFERRED FOR SCALE/ CONSTRUCTION PURPOSE
2. FOR TO THE SCALE DETAILS, PLEASE REFER TO MAP NO. 3-3 b

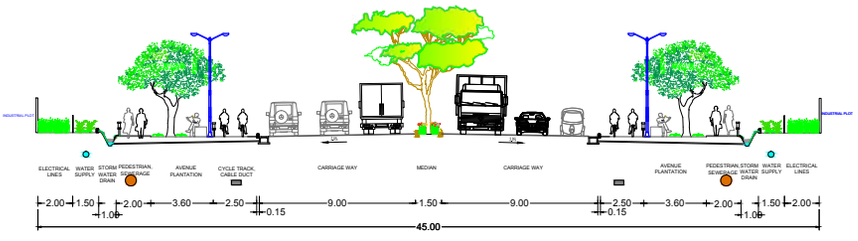
GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

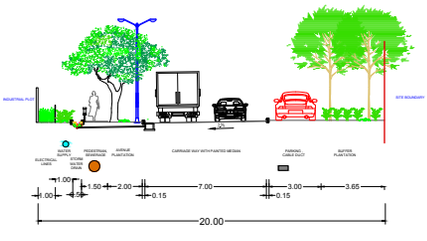
R.F 1:5000 SCALE 100 0 100 200 300 400 500 (in metres)			N
DRAWING NO. 3-4	SHEET SIZE A0	DATE OF PREPARATION	DATE OF REVISION
DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY	



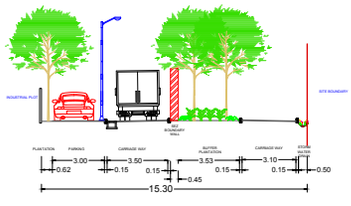
A- A' : 45 M. R.O.W. (WITH 1.5 M STORM WATER DRAIN)



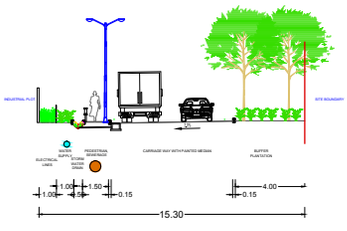
B- B' : 45 M. R.O.W. (WITH 1.0 M STORM WATER DRAIN)



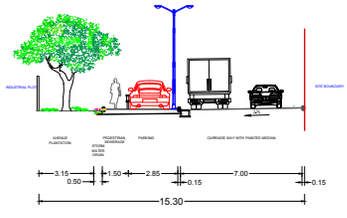
G- G' : 20 M. R.O.W.



I- I' : 15.3 M. R.O.W.



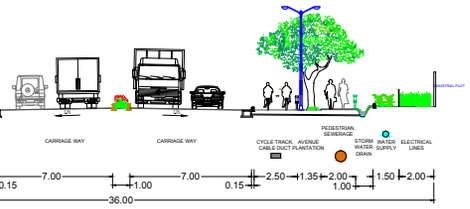
H- H' :15.3 M. R.O.W.



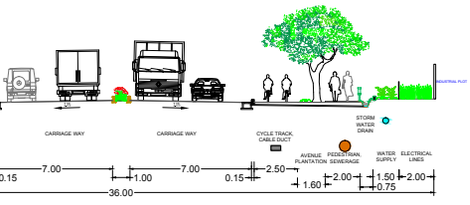
J- J' :15.3 M. R.O.W.

BASIC INFRASTRUCTURE: ROAD CROSS SECTIONS

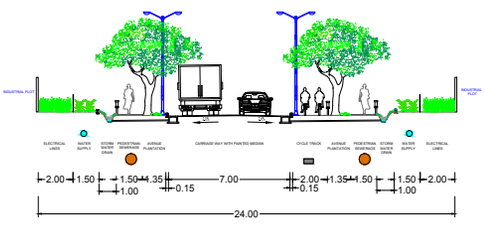
GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 , 418 TO 435, 437 TO 445, 452 TO 459 OF POLEPALLY VILLAGE , JEDC



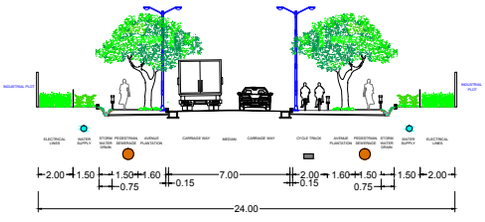
36 M. R.O.W. (WITH 1.0 M STORM WATER DRAIN)



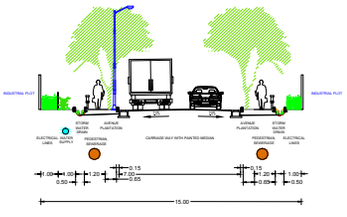
: 36 M. R.O.W. (WITH 0.75 M STORM WATER DRAIN)



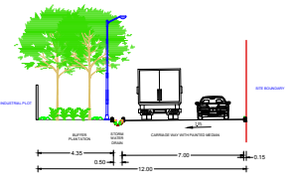
E- E' : 24 M. R.O.W. (WITH 1.00 M STORM WATER DRAIN)



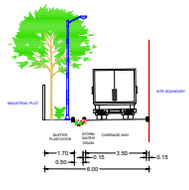
F- F' : 24 M. R.O.W. (WITH 0.75 M STORM WATER DRAIN)



K- K' :15 M. R.O.W.



L- L' :12 M. R.O.W.



M- M' : 6 M. R.O.W.

NOTE:

1. ALL THE ROAD CROSS SECTIONS ILLUSTRATIVE FOR THE PURPOSE OF SHOWING COMPONENTS OF ROAD.
2. WIDTH OF THE CARRIAGE WAY IS 9 M (ONE WAY) FOR 45 M ROAD AND ALL OTHER HIERARCHY WILL HAVE 7M /3.5 M (ONE WAY) TO AVOID BOTTLENECKS
3. ALL THE LEVELS IN THE ROAD CROSS SECTIONS SHOULD BE DETERMINED BASED ON DETAILED ENGINEERING DRAWINGS.
4. THE SECTION OF ALL DRAINS ARE ONLY DESCRIPTIVE, DETAIL STUDIES SHOULD BE DONE TO DETERMINE THE SLOPES, DEPTHS ETC. FOR CONSTRUCTION WORK.
5. THE SERVICES LIKE WATER SUPPLY LINE, SEWERS ETC. ARE INDICATED IN TERMS OF THEIR PLACEMENT ONLY. ACTUAL DEPTH OF THE LAYING SERVICES SHOULD BE REFERRED FROM THE TABLE BELOW:

S.NO.	TYPE OF UTILITY	DEPTH (IN METERS)
1	TRUNK SEWER LINE	2.0 - 6.0
2	WATER SUPPLY	1.0 - 1.5
i	SERVICE LINE	0.6 - 1.0
ii	TRUNK LINE	1.0 - 1.5
3	ELECTRIC CABLE	1.0 - 1.5
i	LT CABLE	0.6 - 1.0
ii	HT CABLE	1.5 - 2.0
4	TELECOMMUNICATIONS CABLE	2.0 - 3.0
i	DIRECTLY LAID	0.6 - 1.0
ii	LAID IN DUCTS	2.0 - 3.0
5	GAS MAINS AND LINES CARRYING COMBUSTIBLE MATERIALS	2.0 - 3.0

SOURCE: URBAN AND REGIONAL PLAN DEVELOPMENT PLANS FORMULATION AND IMPLEMENTATION GUIDELINES (2014), MINISTRY OF URBAN DEVELOPMENT, GOVERNMENT OF INDIA

	R.F. 1:150	SCALE (METRES) 5 4 3 2 1 0 5 10 15	MAP NO. 3-5

HERLA MANDAL , AND 5888 TO 630 OF RAJAPUR VILLAGE , BALANAGAR MANDAL, MAHABOOBNAGAR DISTRICT

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT

2 , 418 TO 435, 437 TO 445, 452 TO 459 OF JAPUR VILLAGE , BALANAGAR MANDAL,

NOTE:15.3 M. ROADS HAVE THREE TYPES OF ROAD CROSS SECTIONS DEPENDING UPON CONTEXT

KEY TO ROAD CROSS SECTIONS

LEGEND

- SITE BOUNDARY
- A-A': 45 M ROAD (1.5 M WIDE STORM WATER DRAIN)
- B-B': 45 M ROAD (1.0 M WIDE STORM WATER DRAIN)
- C-C': 36 M ROAD (1 M WIDE STORM WATER DRAIN)
- D-D': 36 M ROAD (0.75 M WIDE STORM WATER DRAIN)
- E-E': 24 M ROAD (1 M WIDE STORM WATER DRAIN)
- F-F': 24 M ROAD (0.75 M WIDE STORM WATER DRAIN)
- G-G': 15.3 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- H-H': 15.3 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- I-I': 15.3 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- J-J': 15.3 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- K-K': 15 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- L-L': 12 M ROAD (0.5 M WIDE STORM WATER DRAIN)
- M-M': 6 M ROAD (0.5 M WIDE STORM WATER DRAIN)

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

R.F 1:5000		N
SCALE 100 0 100 200 300 400 500 (in metres)		

DRAWING NO.	SHEET SIZE	DATE OF PREPARATION	DATE OF REVISION
3-6	A0		

DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT

DETAIL OF STORM WATER PONDS

S.no.	Name	Length (m)	Breadth (m)	Depth (m)
1	Pond no. 1 (N.G.- 6)	60	50	4
2	Pond no. 2 (O.S. -10)	50	40	2.5
3	Pond no. 3 (Amen - 7)	50	40	2.5
4	Pond no. 4 (N.G.- 2)	50	30	2.5
5	Pond no. 5 (N.G.- 1)	30	20	2.5
6	Pond no. 6 (O.S.- 4)	50	30	2.5
7	Pond no. 7 (O.S.- 7)	40	30	2.5

Note:

1 Above locations and capacities of the storm water storage ponds have been derived from watershed analysis of the area and rainfall data of last 5 years.

2 Proposed ponds have capacity retain 100% peak rainfall water.

EXAMPLE OF LANDSCAPE PROPOSED AROUND STORM WATER COLLECTION PONDS

2 , 418 TO 435, 437 TO 445, 452 TO 459 OF
JAPUR VILLAGE , BALANAGAR MANDAL,

EXAMPLE VIEW OF VERMI-COMPOSTING PLANT AT AMENITY ZONE-3

ARTISTIC IMPRESSION OF CENTRAL GREEN

ENVIRONMENTAL INFRASTRUCTURE

LEGEND

- SITE BOUNDARY
- SEZ BOUNDARY
- PARK
- GREEN PATHWAY
- PUBLIC TOILET
- FOOD KIOSK
- STORM WATER POND
- WASTE WATER TREATMENT POND

NOTE:

1. PUBLIC TOILETS AND KIOSKS HAVE BEEN SYMBOLICALLY SHOWN IN THE MAP, FOR ACTUAL AREA, REFER TO CHAPTER 3 OF THE REPORT
2. DECENTRALIZED WASTE WATER TREATMENT SYSTEMS ARE ALSO SHOWN ONLY IN TERMS OF LOCATION ONLY.

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

R.F 1:5000

SCALE 100 0 100 200 300 400 500 (in metres)

N

DRAWING NO.	SHEET SIZE	DATE OF PREPARATION	DATE OF REVISION
3-7	A0		
DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY	

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT

2 , 418 TO 435, 437 TO 445, 452 TO 459 OF JAPUR VILLAGE , BALANAGAR MANDAL,

RSITY
DUCATION AND TRAINING

ZONE 9

TECHNICAL AND SOCIAL INFRASTRUCTURE

LEGEND

- SITE BOUNDARY
- SEZ BOUNDARY
- AMENITY ZONE
- HIGH TENSION LINE
- FOOD KIOSK
- PARK
- GREEN WAY

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

R.F 1:5000

SCALE 100 0 100 200 300 400 500 (in metres)

N

DRAWING NO.	SHEET SIZE	DATE OF PREPARATION	DATE OF REVISION
3-8	A0		

DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT

COMPONENT

- Car, Bus,
- Truck Par
- Cafeteria
- Bus bay
- Public toil

COMPONENTS OF AMENITY ZONE- 4

Truck Parking	= 12055 sqm
Car, Bus, 2W parking	= 2840 sqm
Cafeteria	= 300 sqm
Bus bay	= 135 sqm
Public toilets	= 15 sqm

COMPONENTS OF AMENITY ZONE- 7

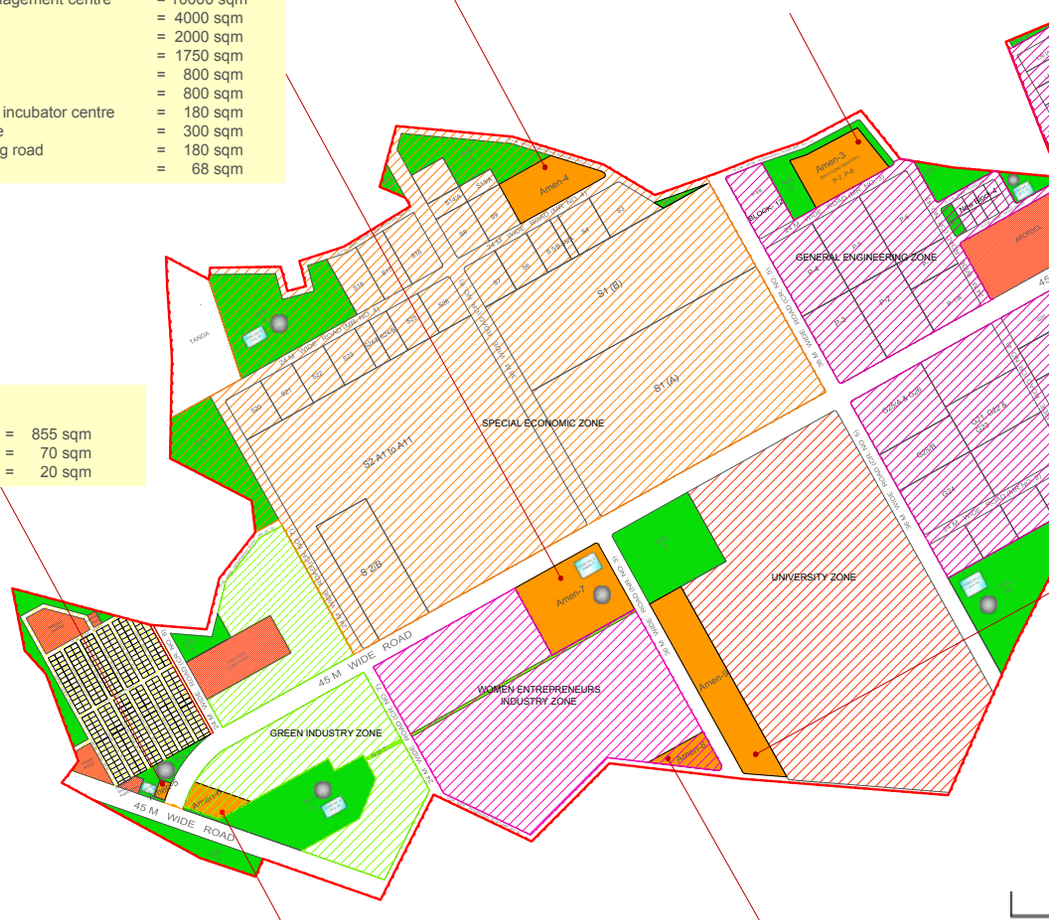
APIIC Business centre	= 12000 sqm
Fire station & Disaster management centre	= 10000 sqm
Police post	= 4000 sqm
Canteen	= 2000 sqm
Guest house	= 1750 sqm
Dispensary	= 800 sqm
Shops	= 800 sqm
Training and incubator centre	= 180 sqm
Weigh bridge	= 300 sqm
Lay bay along road	= 180 sqm
Bus bay	= 68 sqm

AMENITY ZONE 3

E-WASTE AND SOLID WASTE MANAGEMENT = 19970 sqm

ENTRY/EXIT ZONE 2

Truck Parking	= 855 sqm
Bus bay	= 70 sqm
Public toilet	= 20 sqm



COMPONENTS OF AMENITY ZONE- 6

Car, Bus, 2W parking	= 4200 sqm
Truck Parking	= 590 sqm
Cafeteria	= 300 sqm
Bus bay	= 135 sqm
Lay bay	= 180 sqm
Public toilets	= 65 sqm

COMPONENTS OF AMENITY ZONE- 8

Car, Bus, 2W parking	= 4280 sqm
Truck Parking	= 755 sqm
Lay bay along road	= 135 sqm
Ladies room	= 180 sqm
Creche	= 100 sqm
Public toilets	= 45 sqm

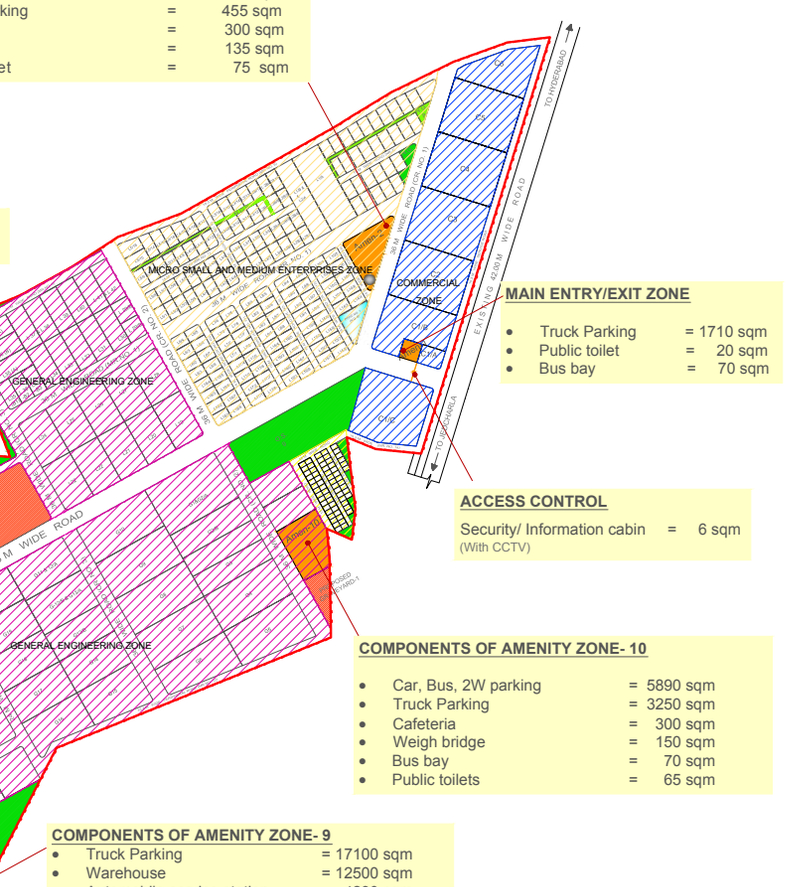
S.no
1
2
3
4
5
6
7

Note:

2 , 418 TO 435, 437 TO 445, 452 TO 459 OF JAPUR VILLAGE , BALANAGAR MANDAL,

S OF AMENITY ZONE- 2

2W	=	6420 sqm
king	=	455 sqm
	=	300 sqm
	=	135 sqm
et	=	75 sqm



MAIN ENTRY/EXIT ZONE

- Truck Parking = 1710 sqm
- Public toilet = 20 sqm
- Bus bay = 70 sqm

ACCESS CONTROL

Security/ Information cabin = 6 sqm
(With CCTV)

COMPONENTS OF AMENITY ZONE- 10

- Car, Bus, 2W parking = 5890 sqm
- Truck Parking = 3250 sqm
- Cafeteria = 300 sqm
- Weigh bridge = 150 sqm
- Bus bay = 70 sqm
- Public toilets = 65 sqm

COMPONENTS OF AMENITY ZONE- 9

- Truck Parking = 17100 sqm
- Warehouse = 12500 sqm
- Automobile service station = 4290 sqm
- Canteen = 2000 sqm
- Weigh bridge = 300 sqm
- Lay bay along road = 180 sqm
- Maintenance centre = 150 sqm
- Dormitory = 72 sqm
- Public toilets = 30 sqm

DETAIL OF STORM WATER PONDS

	Name	Length (m)	Breadth (m)	Depth (m)
	Pond no. 1 (N.G.- 6)	60	50	4
2	Pond no. 2 (O.S. -10)	50	40	2.5
3	Pond no. 3 (Amen - 7)	50	40	2.5
4	Pond no. 4 (N.G.- 2)	50	30	2.5
5	Pond no. 5 (N.G.- 1)	30	20	2.5
6	Pond no. 6 (O.S.- 4)	50	30	2.5
7	Pond no. 7 (O.S.- 7)	40	30	2.5

1 Above locations and capacities of the storm water storage ponds have been derived from watershed analysis of the area and rainfall data of last 5 years.

2 Proposed ponds have capacity to retain 100% peak rainfall water.

REVISED SITE LAYOUT

LEGEND

- SITE BOUNDARY
- ZONE 1 : SPECIAL ECONOMIC ZONE
- ZONE 2 : GENERAL ENGINEERING
- ZONE 3 : MICRO , SMALL AND MEDIUM INDUSTRY
- ZONE 4 : GREEN INDUSTRY
- ZONE 5 : WOMEN ENTREPRENEUR'S INDUSTRY
- ZONE 6 : COMMERCIAL ZONE
- ZONE 7 : UNIVERSITY ZONE
- ZONE 8 : REHABILITATION ZONE
- AMENITY ZONE
- PARKS AND WATER BODIES
- STORM WATER POND
- WASTE WATER TREATMENT
- GREEN PATHWAY

AREA UNDER ZONES

ZONE 1: SPECIAL ECONOMIC ZONE	=	240.60 Acs
ZONE 2: GENERAL ENGINEERING ZONE	=	211.91 Acs
ZONE 3: MICRO MEDIUM AND SMALL ENTERPRISES ZONE	=	65.96 Acs
ZONE 4: GREEN INDUSTRY ZONE	=	41.21 Acs
ZONE 5: WOMEN ENTREPRENEURS INDUSTRY ZONE	=	56.94 Acs
ZONE 6: COMMERCIAL ZONE	=	33.20 Acs
ZONE 7: UNIVERSITY ZONE	=	89.43 Acs
ZONE 8: REHABILITATION ZONE	=	31.90 Acs

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

R.F 1:5000

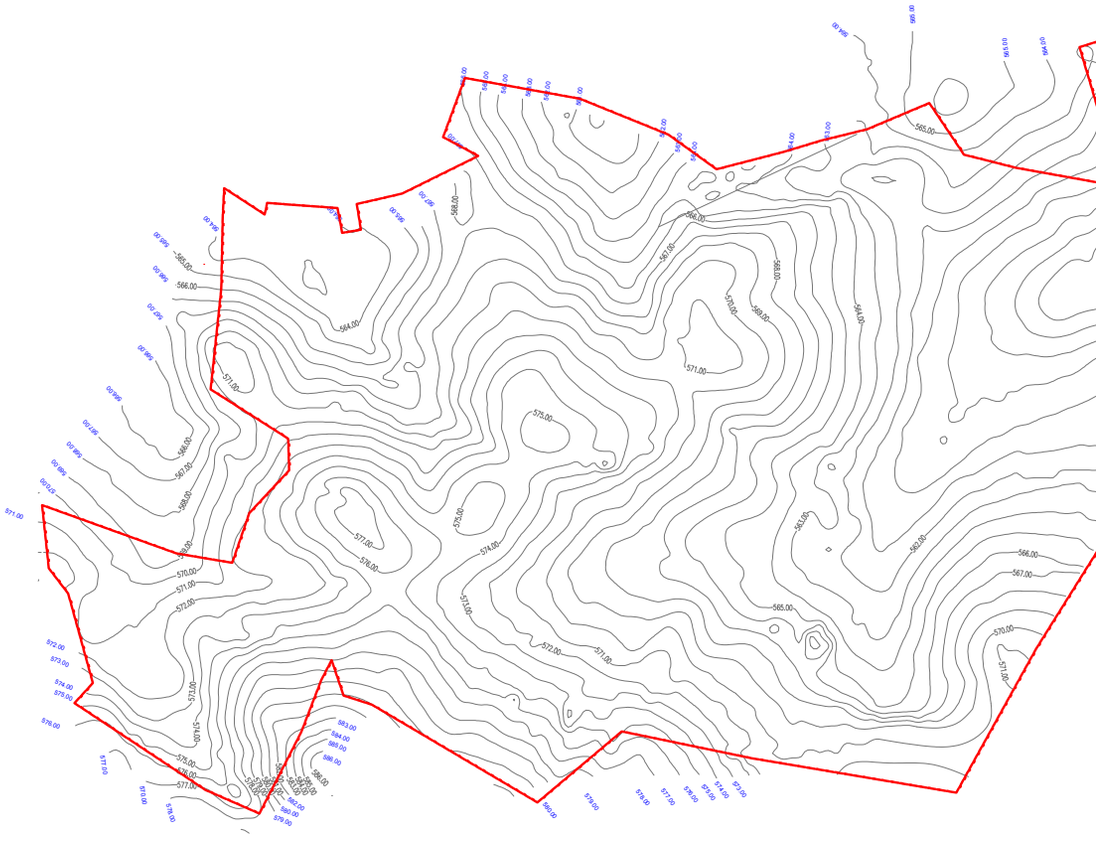
SCALE 100 0 100 200 300 400 500 (in metres)

N

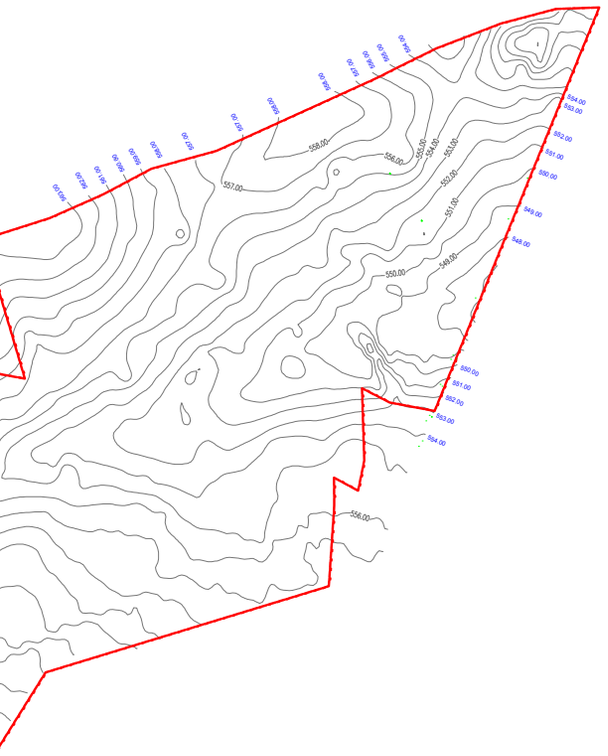
DRAWING NO.	SHEET SIZE	DATE OF PREPARATION	DATE OF REVISION
3-9	A0		

DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY

REVISED LAYOUT PLAN OF GREEN INDUSTRIAL PARK IN SY. NOS. 408 TO 412 POLEPALLY VILLAGE , JEDCHERLA MANDAL , AND 5888 TO 630 OF RA MAHABOOBNAGAR DISTRICT



2 , 418 TO 435, 437 TO 445, 452 TO 459 OF JAPUR VILLAGE , BALANAGAR MANDAL,



CONTOUR MAP

LEGEND

SITE BOUNDARY

GREENING OF GIP JADCHERLA

TELANGANA STATE INDUSTRIAL INFRASTRUCTURE CORPORATION LTD.

R.F 1:5000 SCALE 100 0 100 200 300 400 500 (in metres)			N
DRAWING NO. 3-10	SHEET SIZE A0	DATE OF PREPARATION	DATE OF REVISION
DEALING OFFICER	MANAGER	SANCTIONING AUTHORITY	

Notes:

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