PROJECT BRIEF OF JACKFRUIT AND PROCESSED JACKFRUIT PRODUCTS PROCESSING UNIT

BY

Chhattisgarh State Minor Forest Produce (Trade & Development) Cooperative Federation Limited

S. No.	Particular	Details
1	Project Name	**JACKFRUIT AND PROCESSED JACKFRUIT PRODUCTS PROCESSING UNIT**
2	Location	Village-Pratapara, Dist-Surajpur, Chhattisgarh
3	Land Area (open area, built-up area)	Plot: 17951.57 Sq Meter Factory Shed: 650 Sq Meter
4	The capacity of the Unit in terms of Finished Product Production (in MTPA)	• Jackfruit Pulp: 112.04 • Canned Jack Bulb:134.09 • Dehydrated Jackfruit: 42.46 • Jackfruit Seed Flour:162.96 • Jam: 49.15 • Squash: 36.86 • Chips & Flakes: 15.36
5	Raw Material Quantity of Jackfruit in MT per Annum)	Tender Jackfruit: 1140
6	Number of Working days	150 Days in a Year
7	Total Project Cost	3.76 Cr
8	Indicative Costs (It's bifurcation into total civil and total machinery costs)	A. Total Civil Cost: 1.54 Cr B. Total Machinery Cost: 2.22 Cr
9	Projected electricity requirement	Electricity: 70kW
10	List of Tentative finished Products	Jackfruit Pulp, Canned Jack Bulb, Dehydrated Jackfruit, Jackfruit Seed Flour, Jam, Squash, Chips & Flakes etc.

PROJECT BRIEF– JACKFRUIT AND PROCESSED JACKFRUIT PRODUCTS PROCESSING UNIT

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CHAPTER 1: INTRODUCTION

The state has realized the importance of the fast-growing medicinal plant sector and the global preference towards the Indian System of Medicine. Realizing the potential of medicinal plants and other non-specified Minor Forest Produce (MFP), their availability, and economic utility in the state, the Federation is promoting conservation and non-destructive harvesting of MFP.

Project Concept (Jackfruit Processing Unit)

Jackfruit is a multi-purpose species providing food, timber, fuel, fodder, and medicinal and industrial products. The primary economic product of Jackfruit is the fruit which is used both when mature and unripe. The fruit pulp is sweet and tasty and used as a dessert or preserved in syrup. The fruits and seeds are also processed in a variety of ways for food and other products. Jackfruit value-added products include chips, papads, pickles, ice cream, jelly, sweets, beverages like squash, nectar, wine, and preserved flakes, etc. It is a nutritious fruit that is rich in carbohydrates, proteins, potassium, calcium, iron, and vitamin A, B, and C. Due to high levels of carbohydrates, jackfruit supplements other staple foods in times of scarcity in some regions. The flesh of the jackfruit is starchy and fibrous and is a source of dietary fiber.

India is the second largest producer of Jackfruit globally. Besides India, it is extensively cultivated in the South and Southeast Asia countries including Bangladesh, Thailand, Indonesia, and Nepal. Jackfruit possesses an impressive nutrition profile. It was traditionally used as a remedy, since it provides multiple health benefits including antioxidant protection, maintaining cardiovascular health, and enhances immunity.

CHAPTER 2: ABOUT JACKFRUIT

INTRODUCTION

The jackfruit (Artocarpus heterophyllus) is also known as the jack tree. India is the second largest producer of Jackfruit in the world and is considered the motherland of jackfruit. According to some, Chakka, its Malayalam name, has given birth to the English name jackfruit. In India, the total area under cultivation of jackfruit is approximately 1,02,552 hectares, of which an estimated 10,00,000 trees are grown in back yards and as intercrop in other commercial crops (betel nut, coffee, pepper, and cardamom plantations) in south India. It is widely distributed in Assam, Tripura, Bihar, and Uttar Pradesh, as well as the Himalayan foothills and South Indian states[1].

The trees are found in southern states such as Kerala, Tamil Nadu, Karnataka, Goa, coastal Maharashtra, and other states such as Assam, Bihar, Tripura, Uttar Pradesh, and the foothills of the Himalayas.

Image of Jackfruit

Origin:

Jackfruit is a tropical fruit species found in tropical, high rainfall, coastal and humid areas of the world. Jackfruit does not spread readily and is not considered invasive species. In most areas of the world where jackfruit is grown, its presence is indicative of human cultivation. Jackfruit was introduced to most Pacific Islands, mainly in-home gardens, where it finds a place among other favourite multipurpose plants. It is easy to grow and more adaptable than some of the other common Artocarpus species like breadfruit.

All parts of the tree have been reported to have medicinal properties. The Chinese consider jackfruit pulp and seeds as a tonic, cooling, and nutritious, and to be useful in overcoming the influence of alcohol on the system. The seed starch is given to a person to relieve biliousness and the roasted seeds are regarded as an aphrodisiac. The ash of jackfruit leaves if mixed with corn and coconut shell ash is used alone or mixed with coconut oil to heal ulcers. The dried latex yields artostenone, a compound that is convertible to artosterone, which has a potent

androgenic property. If mixed with vinegar, the latex promotes the healing of abscesses. The root is a remedy for skin diseases and asthma. An extract of the root is taken and used as a cure for fever and diarrhoea. The bark is made into poultices. Heated leaves are placed on wounds. The wood has a sedative property; its pith is reported to induce abortion. Aside from flavouring for beverages, the fruit can be fermented and distilled to produce alcoholic liquor.

Jack fruit Varieties in India

The state wise varieties of Jackfruit in India are detailed below.

Table 2: Varieties of Jack Fruit in India	
State	**Cultivars/varieties**
Chhattisgarh	Local Genotypes (Khaza, Singapore, Silon)
Himachal Pradesh	Local Genotypes, (Gulabi, Champa, Hazari)
Karnataka	Palur-1 Jack, PP-1, Jack PLR (J)-2, Swarna
Kerala	Local genotypes (Idukki, Wayanand, Kannur, Thiruvananthapuram
Madhya Pradesh	Local genotypes (Khaza, Singapore, Silon)
Maharashtra	Konkan Prolific
Odisha	Local genotypes (Khajra, Kadua)
Tamil Nadu	Palur 1 Jack (PLR 1), PP-1 Jack, PLR (J)-2, Local genotypes (Valipala, Singapore, Panruti Selection, Thanjavur Jack, Burliar 1)
Tripura	Local Genotype

Health Benefits of Jack fruit

The jackfruit tree is a tropical fruit that is high in carbohydrates, proteins, vitamins, minerals, dietary fiber and phytochemicals. Anticarcinogenic, antimicrobial, antifungal, anti-inflammatory, wound healing and hypoglycaemic properties are just a few of the health benefits of jackfruit.

The below-mentioned table shows the chemical constitutes and composition of Jackfruit.

Table 3: Chemical Composition of Jackfruit			
Nutrients	**Young fruit**	**Ripe fruit**	**Seed**
Water (g)	76.2-85.2	72.0-94.0	51.0-64.5
Protein (g)	2.0-2.6	1.2-1.9	6.6-7.04
Fat (g)	0.1-0.6	0.1-0.4	0.40-0.43
Carbohydrate (g)	9.4-11.5	16.0-25.4	25.8-38.4
Fibre (g)	2.6-3.6	1.0-1.5	1.0-1.5
Total sugars (g)		20.6	
Total minerals (g)	0.9	0.8-0.9	0.9-1.2
Calcium (mg)	30.0-73.2	20.0-37.0	50.0
Magnesium (mg)	NA	27.0	54.0

Phosphorus (mg)	20.0-57.2	38.0-41.0	38.0-97.0
Potassium (mg)	287.0-323.0	191.0-407.0	246.0
Sodium (mg)	3.0-35.0	2.0-41.0	63.2
Iron (mg)	0.4-1.9	0.5-1.1	1.5
Vitamin A (IU)	30.0	175.0-540.0	10.0-17.0
Thiamine (mg)	0.05-0.15	0.03-0.09	0.25
Riboflavin (mg)	0.05-0.2	0.05-0.4	0.11-0.3
Vitamin C (mg)	12.0-14.0	7.0-10.0	11.0
Energy (kJ)	50-210	88-410	133-139

Mentioned below table highlights the Nutritional value of Jackfruit.

Table 4: Nutritional constitutes & composition of Jack fruit (per 100g)		
Nutrients	**Nutrient value**	**Recommended Dietary Allowance (%)**
Cholesterol (mg)	0	0
Dietary fiber (g)	1.5	4
Vitamins		
Folate (µg)	24	6
Niacin (mg)	0.92	6
Pyridoxine (mg)	0.329	25
Riboflavin (mg)	0.055	4
Thiamin (mg)	0.105	9
Vitamin A (IU)	110	3.5
Vitamin C (mg)	13.7	23
Vitamin E (mg)	0.34	2

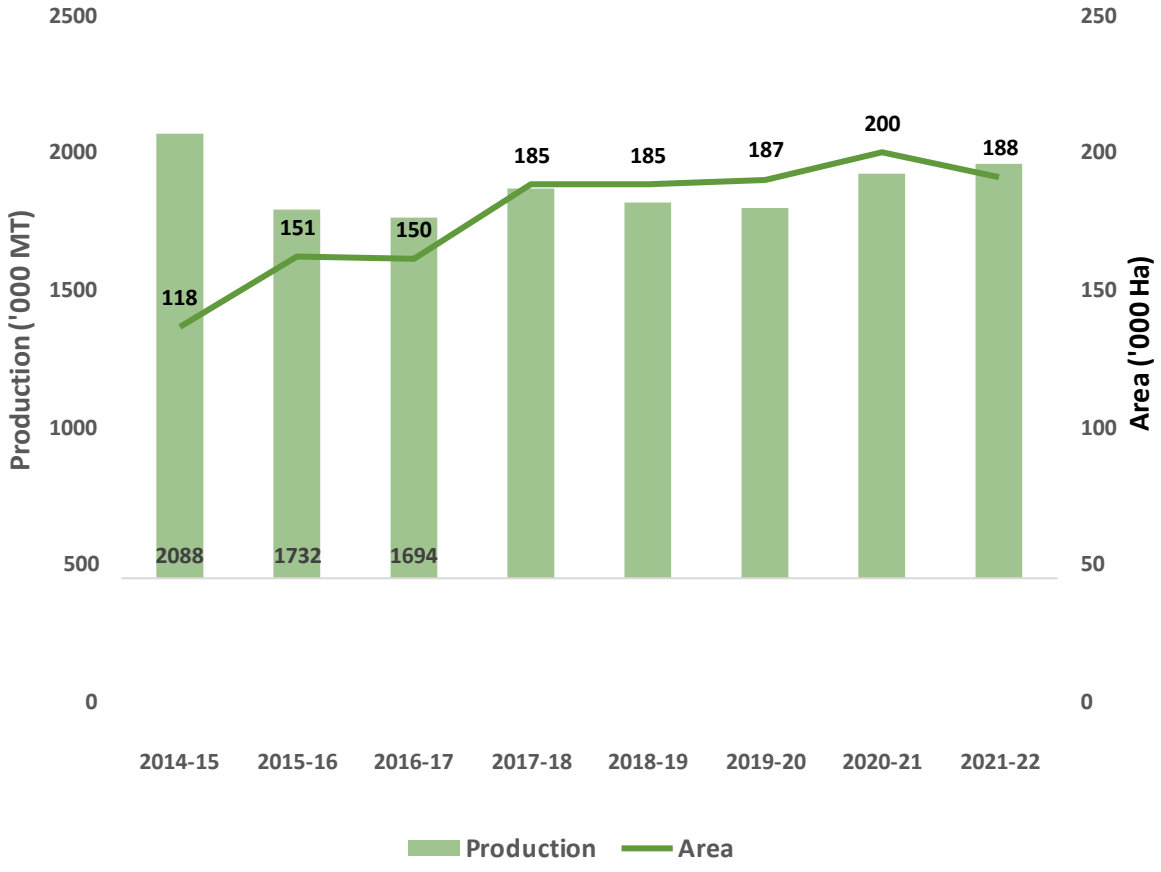
Table 4: Nutritional constitutes & composition of Jack fruit (per 100g)		
Nutrients	**Nutrient value**	**Recommended Dietary Allowance (%)**
Electrolytes		
Sodium (mg)	3	0
Potassium (mg)	303	6.5
Minerals		
Calcium (mg)	34	3.4
Iron (mg)	0.6	7.5
Magnesium (mg)	37	9
Manganese (mg)	0.197	8.5
Phosphorus (mg)	36	5
Phosphorus (mg)	21	3
Selenium (mg)	0.6	1
Zinc (mg)	0.42	4
Phytonutrients		
Carotene-ß (µg)	61	
Crypto-xanthin-ß (µg)	5	
Lutein-zeaxanthin (µg)	157	

Availability of Jackfruit in India

National Profile of Jackfruit

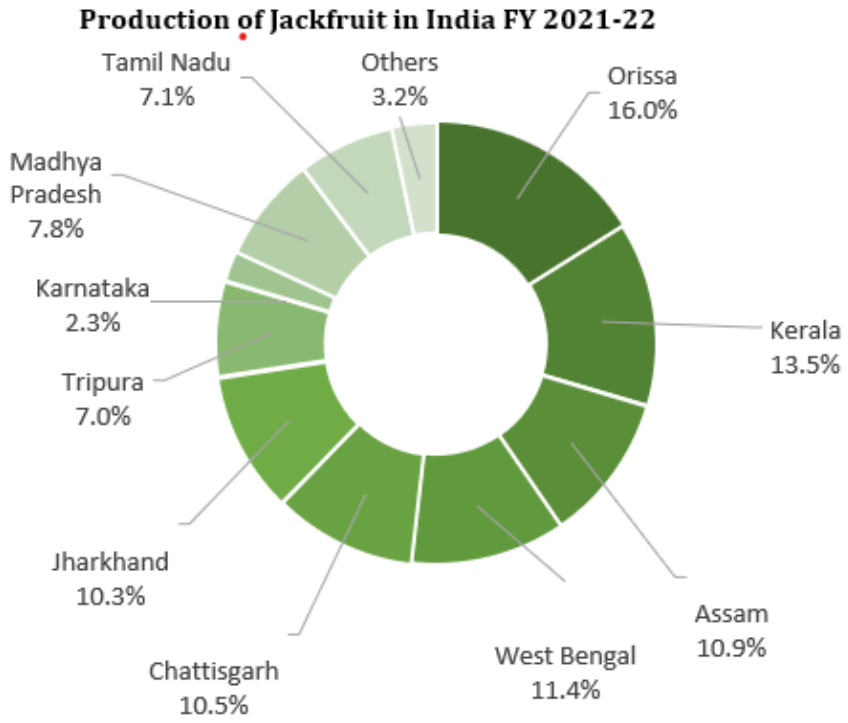
Jackfruit is one of the major fruits in India. According to Horticulture Statistics at glance, Jackfruits is produced in West Bengal, Kerala, Chhattisgarh, Tamil Nadu, Assam, Karnataka, Tripura, Odisha, Jharkhand. The data indicate that the production of Jackfruit has been increasing gradually from 2015-16 to 2017-18. The below shown graph depicts that the production of Jackfruit reached 1946000 MT in 2021-22.

Figure 3: Area and Production Trends of Jack Fruit in India during FY 2014-15 to 2021-22



Production of Jackfruit in India

Jackfruit is a tropical climacteric fruit, belonging to the Moraceae family, is native to south and Southeast Asia where India is the second biggest producer of fruit in the world and is considered the Motherland of jackfruit. In India, the jackfruit trees are abundantly distributed in southern states like Kerala, Tamil Nadu, and Karnataka, and are also widely found in states like Orissa, Chhattisgarh, Madhya Pradesh, Assam, Bihar, Jharkhand, West Bengal, etc. According to the National Horticulture Board (NHB) Govt. of India, Orissa is the leading producer of jackfruit in India which contributes 16 per cent (312000 MT) of total production followed by Kerala 13.5 percent(263000 MT) Assam 10.9 per cent (212000 MT) West Bengal 11.4 per cent (221000 MT), and Chhattisgarh contributes 10.5 Percent (204000 MT) which placed 5th position among all the states in India during FY 2021-22 as shown in the figure[3].

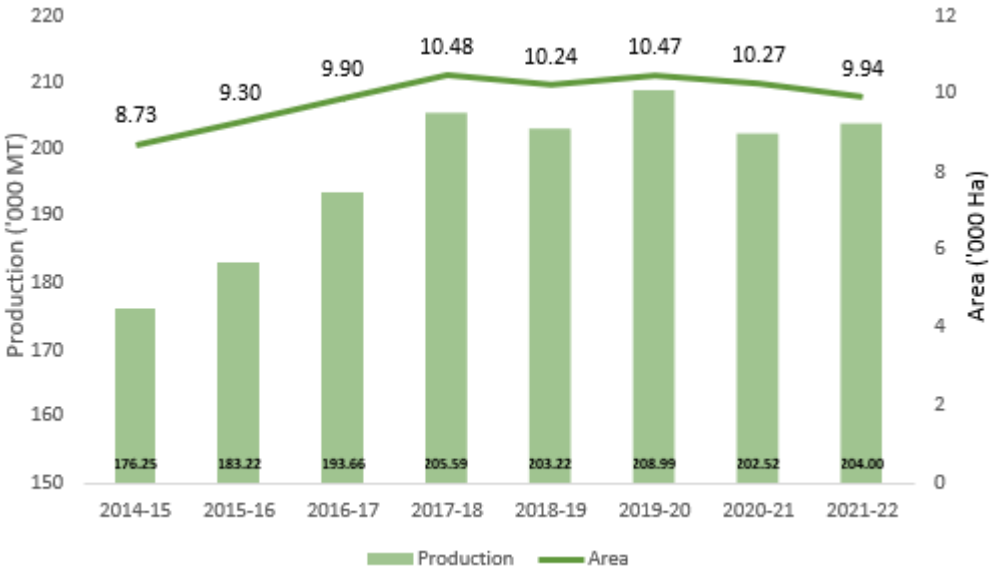


Total Production-1946000 MT

Availability of Jackfruit in State of Chhattisgarh

Chhattisgarh stood among the top 5 states in Jackfruit production during 2021-22. The state produced 204000 MT of Jackfruits in the year 2021-22, contributing approx. 10.5% to the national production for the year[4]. The majority of Jackfruit is cultivated under natural conditions, often growing as scattered plantations. The production of within state is sufficient to meet the demand of fruit within the state, and there is an immense untapped potential for supplying to other states as fresh fruit or for processing into various products to meet the demand of consumers through value-added products across different states and abroad. The production of jackfruit in Chhattisgarh during FY 2014-15 to 2021-22 are provided below.

Area and Production of Jack Fruit in Chhattisgarh during FY 2014-15 to2021-22



This shows that Chhattisgarh has an immense untapped potential where intervention may lead to the processing of Jackfruits for various markets and meet the needs of consumers across India & abroad.

Availability of Raw Material in neighbouring district

Fresh jackfruit is the basic raw material for jackfruit value added product processing industries. A sustainable food processing unit must ensure maximum capacity utilization and thus requires an operation of a minimum of 200 days per year to get reasonable profit. Therefore, ensuring uninterrupted raw materials supply requires the maintenance of adequate raw material inventory. The processor must have linkage with producer organizations preferably FPCs through a legal contract to get adequate quantity and quality of raw materials which otherwise get deteriorated. In the current Jackfruit processing project, there is a huge possibility of procurement of jackfruit from neighbouring states like west Bengal, Orrisa, Kerala, Assam, Tripura, Madhya Pradesh and Jharkhand etc. The Area and Production of Jackfruit of these states has been provided below:

Table 4: Area and production of jackfruit different states of India

State	Area	Production
Orissa	13.56	312
Kerala	91.70	263
Assam	22.51	212
West Bengal	12.32	221
Jharkhand	14.93	200
Tripura	5.60	136
Madhya Pradesh	7.12	151
Area (‘000 Ha) and production (‘000 MT)		

Seasonality of Jackfruit Production

Generally, the Jackfruit plant starts producing fruits from the 7th - 8th year onwards. Grafted plant starts to yield from 4th - 5th year itself. Normally the fruits are available for consumption from March to June. In higher elevation, the harvesting season extends up to September. Even in plains, certain genotypes bear an off-season crop during October - December[6].

Jackfruit has got the immense potential for value addition. A wide variety of items can be prepared from jackfruit right from immature stage to well-ripened stage. Each item has its own qualities in terms of taste, preference, shelf-life, etc. Because of its heaviness and large size, transportation and packaging are huge impediments to the successful marketing of jackfruit. Therefore, value-added products have more relevance for the commercial utility rather than the whole fruit. Jackfruit can be preserved by applying various techniques like drying, freezing, canning, or by converting it into various products.

State	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Tripura												
Assam												
Orissa												
Chhattisgarh												
Kerala												
West Bengal												

	Green Jackfruit		Ripe Jackfruit

Post-Harvest Management Storage of Jackfruit

Collecting the harvesting Fruit: After harvest, the fruit should be laid for some time with its stalk down to allow the latex to flow and coagulate. The use of dried banana leaves, or other cushioning materials placed in between the layers of fruits can minimize mechanical damage during transport. It is also important to prevent the spread of latex on the surface of the fruits so that they look fresh.

Transport: It is usually done in motorized vehicles (trucks and vans). The vehicles must be clean to avoid impurities such as dirt and stones that damage the fruit, thereby endangering the quality and shelf life of the fruit.

Jackfruit, being bulky and highly perishable, has quite high transport costs. Hence processing locally will enable reduced transport costs.

Storage: Harvesting of jackfruit in the green mature stage can prevent mechanical damage. Also, adaption to appropriate postharvest practices may facilitate the exportation through extended shelf life. Storage of the whole jackfruit at 10°-12°C and 85-90% humidity can extend the shelf life of the crop approximately by two weeks.

Various Processed Products from Jackfruit

Jackfruit constitutes three parts viz., bulb (30-32%), seeds (13-15%), and the rind (5-55%) of the ripe fruit. The primary economic product of jackfruit is the fruit, used both when immature and when mature. The fresh de-seeded sweet pulp of the fruit is consumed as such by people and cannot be stored for a long time due to its perishability as a result huge post-harvest loss (30-35%) occur during the peak season. The fruit pulp is sweet and tasty and used as a dessert or preserved in syrup. The ripened pulp of fruitlets is used to flavour products such as ice cream and beverages and the fresh pulp is used to prepare jams, chutneys, jellies, or candies. Dried pulp is made into chips[7].

The jackfruit seeds contained in the ripe fruits are also cooked, boiled, or roasted for direct consumption. The fruits and seeds are also processed in a variety of ways for food and other products. The green jackfruits are being utilized as a vegetable and processed to make pickles. It is nutritious, rich in vitamin A, B, and C, Calcium, Potassium and Iron, pectin, etc.

The importance of the fruit, seed, and rind is known very little to the growers and consumers. Hence, the University of Agricultural Sciences has taken up an important research and development project in their Post-Harvest Engineering and Technology Centre to develop value-added products from Jackfruits to utilize the surplus fruits available during the season as well as improve the livelihood of the farmers by enabling them to produce value-added products to improve their income as well as provide the surplus fruits to the fruit processing industries in their region which can produce these value-added products in large scale.

Various value-added products of Jackfruit

Jackfruit Seed Powder

Jackfruit Chips

Jackfruit Pickle

Canned Fruit

Squash

Fruit Bar

Cut Fruit

Jam

There are nine different value-added products from different parts of the Jackfruit that can be processed as mentioned below:

S. N	Value-added products	Description
1.	Canned Jackfruit	Apart from the domestic market, canned jackfruits have good export potential also. As raw fruit is a highly perishable item, we can preserve it in sugar syrup for a long duration of time. We need to use the crisp bulbs of the ripe Jackfruit for canning purposes. Also, we will needraw materials like Sugar, Citric Acid and packing materials like Tin Can, etc.
2.	Fruit Bar	Generally, fruit bars are healthy snack items that provide a delicious taste also. It is also popular as fruit toffee. So, fruit bars have a wide market throughout the country. wecan prepare the fruit bar from jackfruits also. Commercialmanufacturing is a highly profitable business. As the raw materials, we will need starch, sugar, colour, preservatives, skimmed milk powder, hydrogenated fat, flavour, glucose, etc.
3.	Ice Cream	Ice creams in different fruit flavour are getting huge popularity these days. Currently, people of all age groups consume ice creams throughout the year. Hence, it is not a seasonal business. And we can prepare ice cream with jack pulp.
4.	Jackfruit Chips	Raw jackfruit is the basic raw material for fried jack chips. First, cut the raw jackfruits into large pieces. Then, remove the bulbs and seeds by hand. Then cut the raw bulbs into suitable lengthwise pieces. Finally, fry these pieces in coconut oil or refined vegetable oil. Also, we may add salt to the frying pieces to enhance their taste and preservation
5.	Jackfruit Nectar	"Nectar" typically refers to beverages produced by dilution of fruit pastes or juices with or without the

S. N	Value-added products	Description
		addition of sweeteners. It is a healthy food item even for children and seniors. in nectar processing, you will need to remove the bulbs from ripe jackfruit. And pass them through a pulping/fruit mill. Then mix with about 10% hot water and pass through a pulper having a fine sieve of 1 mm hole. Now we can use this pulp for preparing nectar.
6.	Jackfruit Squash	In our country, fruit squash is a popular product in preparing homemade cold drinks like sharbat. we can find a wide number of established brands like Kissan, Druke, Ruhafza, etc. we can prepare jackfruit squash from the juice and pulp. The manufacturing process is simple. We will need to provide good quality moisture and leak-proof packaging.
7.	Jack Seed Flour	The manufacturing of jackfruit seed flour is easy. Also, the technology is readily available for entrepreneurs. Due to its high carbohydrate content and other nutrients, they can be added to baked products for value addition without affecting the functional and sensory properties of the final product.
8.	Jam	For jam preparation, we will need to use fully ripe jackfruits. we can prepare it by boiling fruit pulp with sugar, pectin, and acid. we need to invest a small startup capital for starting a small-scale unit. Jam is an intermediate moisture food and high sugar content increases its caloric value. Due to the sweet taste, people of all age groups consume jam frequently.
9.	Pickles	we will need to use unripe jackfruits for preparing pickles. Apply oil to a knife and peel the jackfruit. Peel the skin. Cut the peeled fruits into 12-18 mm thick slices. Prepare a 5% common salt solution by mixing salt with water, 50 g salt/l. Place the slices in a container and cover with the brine solution. Drain the slices after 24 hours. Finally, grind and mix with spice and vinegar and cook it to make taste.

Jackfruit is a highly fibrous fruit. Also, can be kept as ripe fruit fresh for a long duration of time. Therefore, you need to take considerable care in the time of procuring fresh jackfruits for preparing any type of value-added food products.

India, the world's largest producer of jackfruit, is cashing in on the fruit's rising appeal as a "superfood" meat substitute, praised by chefs from San Francisco to London and Delhi for its pork-like texture when unripe. It's used in curries or fried, minced, and sautéed when it's unripe. Shredded jackfruit has become a popular substitute for pulled pork in the West, and

it is even used as a pizza topping. The jackfruit tacos have been a huge hit at all locations in US.

Table 5 : Various Manufacturing and processing Company of value-added products of Jackfruit

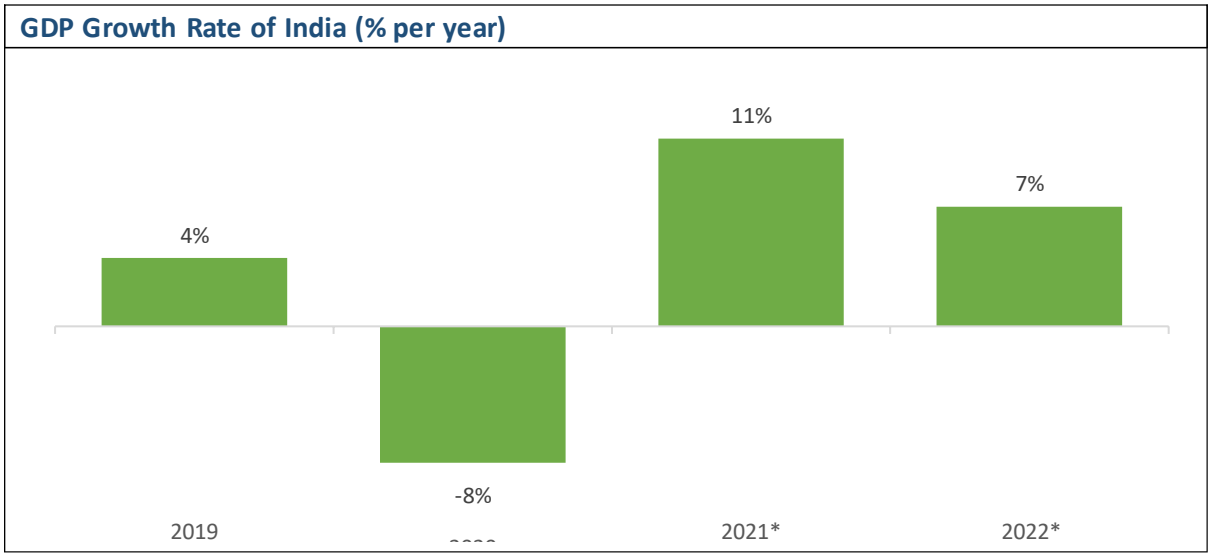
Jackfruit Products	Brands
Ready to Eat, Curry	The Jackfruit Company, Wakao
Canned Jackfruit	Twin Elephant
Chips	Urban Platter, Flavours of Calicut
Jam	NaturUp, Nature Land
Pickle	Urban Platter, Addme
Cut Fruit (Cut & Peeled)	Living food company
Flour	Jack Fruit 365, Wakao, Korah's
Squash	Jumbo
Fruit Bar	Go Desi

The detailed market presence, market size, market share and market growth of different value-added products of jackfruit for various Brands in India are difficult to manage because the Brands are not ready to provide which is very confidential. however, according to secondary research the market size/price of different value-added products of jackfruit for various Brands in India are mentioned in detail.

CHAPTER 3: MARKET POTENTIAL

Overview

Emerged as the world's fastest growing economy, India is expected to become one of the top three economic powers in the world by 2030 or 2035. It is also expected that one-fifth of the world's working population will be Indian by 2025 with over 850 million internet users 2030. In terms of real gross domestic product (GDP) at current prices, India stood at USD 2.71 trillion in the financial year 2020-2021. The per capita GDP of the country has increased from USD 1,458.10 in 2011 to USD 2,099.60 in 2019, growing at a CAGR of approximately 7% (2011- 2019)[18].



More households are entering higher income groups. Disposable incomes are increasing steadily in India. On average, every Indian is earning 30 percent more than what they used to earn in 2015. Per capita income in India increased at CAGR of 5% from ₹ 72,805 in FY15 to ₹94,954 in FY19. However, the pandemic has affected the per capita income in India negatively to attain a level of ₹ 85,929 with a growth of -9.1%.

With the next wave of unicorn 'start-ups' coming, India is in a very comfortable position with 21 unicorns collectively valued at USD 73.2 billion in 2020 and with 10 more start-ups entering the unicorn club in the first four months of the year 2021. FDI inflows in India increased from USD 74.3 billion in 2019-2020 to USD 58.37 billion between the months of April and November in the year 2020. The FDI inflows in the food processing sector stood at USD 904.7 million in 2019-2020 suggesting increased interest in the sector amongst investors. Owing to the rise in startup culture in India, the Chhattisgarh government is promoting startups and innovators in the agriculture and allied sector through Biotech Incubation Centre and Agri-Business Incubation and Production Centre.

Table 7 : Government of India recognised start-ups in Chhattisgarh	
Particulars	**By the month of September 2019**
No. of Start-ups registered	293
No. of seed funded start-ups	13
No. of venture funded start-ups	0
No. of incubators in state	3
No. of incubates	102
Purchase order awarded	1

Source: Directorate of Industries, Chhattisgarh

Favourable changes in Demographic patterns

India's population has increased from 125.03 crores in 2011 to approximately 138 crores in 2020 with a yearly growth of 0.99% whereas the state of Chhattisgarh has witnessed an increase in population from 2.56 crores in 2011 to 2.94 crores in 2020. The total dependency ratio of the country is 48.7 and approximately 42% of the total population falling in the 25-54 age group. By 2025, the median age in India is expected to be 39 years. Hence median age will be in the working age population segment and not in the 'dependent' age population segment. India is expected to have over 550 million people below 25 years of age and over 800 million people in the productive age group of 20-60 years by the year 2050. By the year 2020, 34.9% of the total Indian population resides in urban settings with the rate of urbanization being 2.37% per annum from 2015- 2020.

Jackfruit Market

The major populace in the jackfruit-producing areas normally consume ripe fruits and seeds locally, with some quantity of fruits finding their way to the markets. However, due to the bulk and weight of the fruit and its perishability, long distance markets are unreachable and most of the fruit is left to rot in the orchards. However, in the last 5-6 years, jackfruit has been getting paramount importance from the urban consumers and abroad markets in value-added and processed forms. As per a market study on Jackfruit, it has been estimated that approx. **25% of the production is channelled into the manufacturing of value-added products.**

The rising concerns for climate change fuelling the vegan culture across the globe has led to an increase in demand for jackfruit worldwide causing a rise in exports from the country to west Asian countries, Germany, and Great Britain. India, the leading producer of Jackfruit, exported the superfood to over 75 countries worth USD 2.3 million in the year 2020-2021 (April to November) with the total volume of export around 2,300MT in the same period. In May 2021, approximately 1.2 tonnes of jackfruit sourced from Krishi Sanyoga Agro Producer Company of Tripura was exported to London[19].

The entire jackfruit tree is loaded with various use cases. Apart from being used as fruit when ripe and as a vegetable when consumed in an unripe state, the leaves of the jackfruit are used as cattle feed. The wood from the tree is termite-proof and is superior to teak for furniture,

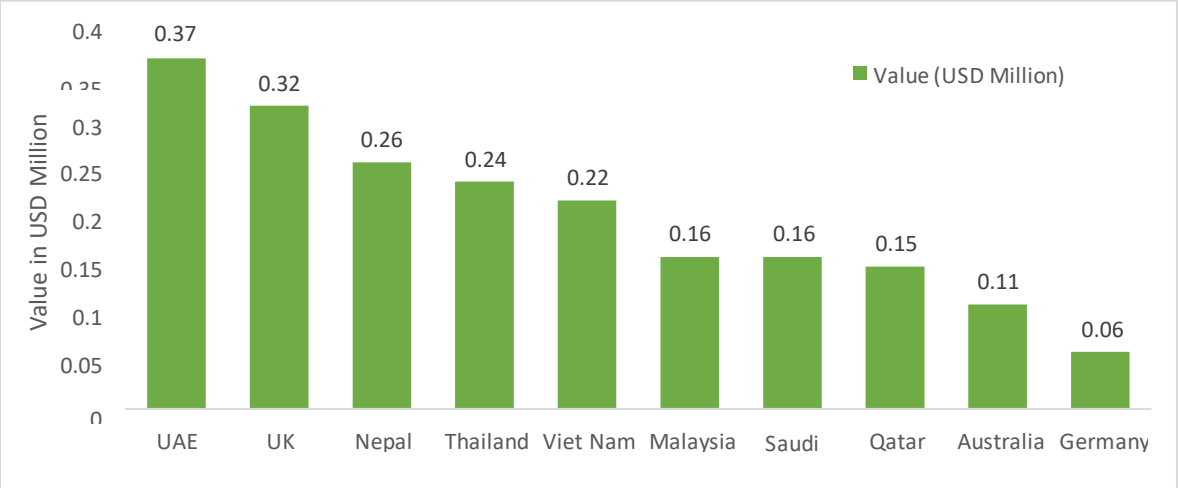
construction, musical instruments, etc. Consumers in countries including the UK, the US, and Germany perceive the cooked, unripe Jackfruit has a texture like pulled pork or chicken, making it a popular vegan option in these countries. Brands such as The Jackfruit Company and Upton's Naturals have shown how versatile an ingredient the fruit can be, consistently launching new products such as curry, pasta, and noodle meal kits all based around the meaty fruit.

Marketing Potential of Jackfruit

Exports for Jackfruit Value-added Products from India

United Arab Emirates is the largest market for Jackfruit export from India. In 2020-2021 (Apr-Nov), United Arab Emirates imported 0.37 USD million worth Jackfruit from India.

The top 5 trading partners of India are United Arab Emirates (0.37 USD Million), United Kingdom (0.32 USD Million), Nepal (0.26 USD Million), Thailand (0.24 USD Million), Viet Nam (0.22 USD Million) . The total export value of Jackfruit in these countries is 1.41 USD million. These top 5 countries account for over 61.3% of the total Jackfruit export from India.



Country	Value (USD Million)	Share (%)
United Arab Emirates	0.37	16.09
United Kingdom	0.32	13.91
Nepal	0.26	11.3
Thailand	0.24	10.43
Viet Nam	0.22	9.57
Malaysia	0.16	6.96
Saudi Arabia	0.16	6.96
Qatar	0.15	6.52
Australia	0.11	4.78
Germany	0.06	2.61
Total	**2.05**	**89.13**

Among the top countries, United Arab Emirates market share of the total Jackfruit export shipments from India is 16.09%. Followed by United Kingdom with the Jackfruit shipment

value being 0.32 USD Million. The top 10 countries in total shared the share of 89.13% of the Jackfruit export value from India.

The following table gives insights on a monthly report of November 2020 on Jackfruit export from India to the top 8 trading partners.

Country Wise Trends for Jackfruit export (USD Million)			
S.no.	**Country Name**	**Qty in Kgs**	**Value (USD Million)**
1	United Arab Emirates	22010	0.04
2	Kuwait	8370	0.02
3	Qatar	12180	0.02
4	Singapore	7660	0.02
5	Australia	1970	0.01
6	Bahrain	4560	0.01
7	Oman	3820	0.01
8	Saudi Arabia	6170	0.01
Total		**66740**	**0.14**

In the month of November 2020, India majorly exported Jackfruit to United Arab Emirates (0.04), Kuwait (0.02), Qatar (0.02), Singapore (0.02), Australia (0.01). The total export volume and export value of these top 5 importing countries is 52190 and 0.11 USD million, which is the 78.57% of the overall export volume in the month of November 2020.

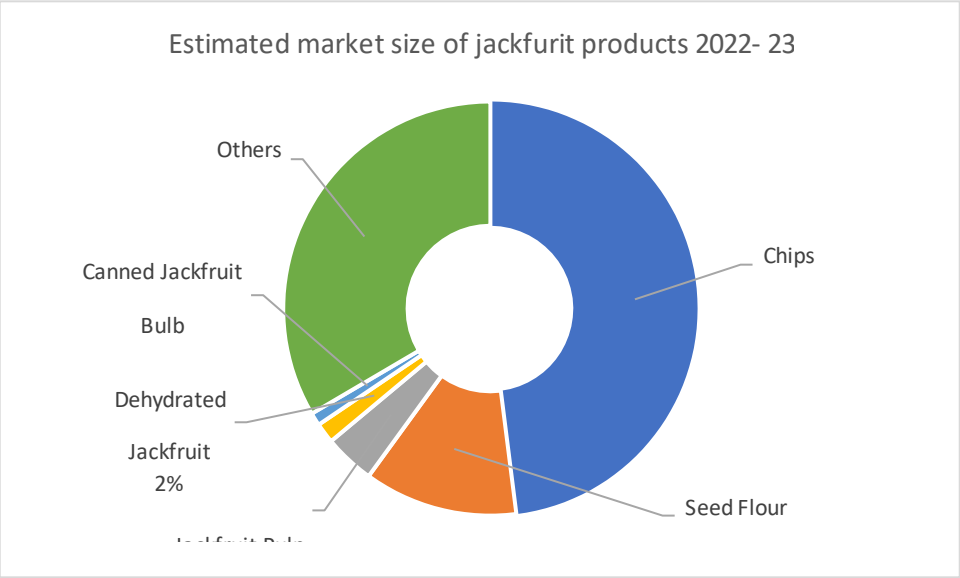
However, the export data of value-added products of jackfruits are not available hence we have provided the above data which are according to the connect to India export data[20].

In India

Jackfruit has immense potential for value addition, wherein a variety of items can be prepared from jackfruit right from immature stage to well-ripened stage. Value-added products have more relevance for the commercial utility rather than the whole fruit due to the heavy fruit size and transportation cost incurred in moving the fresh produce to consumers. The market for jackfruit products is valued at ₹1,252 Crore in India in 2017-18 and is projected to grow to approximately ₹1,580 Crore in the next five years (2021-22). The market is dominated by the unorganized sector players, accounting for approx. 95% of the market. The major portion of the Jackfruit market is captured by chips and papads, which account for approximately 70% share of the market by value and approximately 80% share by volume. Chips and papads are prepared from fully matured Jackfruit, wherein several tiny and household units manufacture jackfruit chips and supply them to domestic retail outlets. For processing, Jackfruit is mainly preserved by applying various techniques like drying, freezing, canning, or by converting it into various products.

Based on the above estimate about the jackfruit products' market size in India, further projections have been provided till 2025-26. Certain assumptions have been validated based on primary information received from the suppliers of jackfruit products. The market is estimated to grow at a CAGR of 4.78% annually till 2022-23. The products like chips and papad, though are the major product segments in the market, however, the growth prospects

for these products are not very promising, as these are not considered as healthy foods by consumers and create obesity, thus less preferred by health-conscious consumers. Thus, the growth rates for these products have been considered slightly lower at around 3.2% annual for the projection period (2023-24 to 2025-2026), considering the similar growth rate as in the case of competing product (potato chips). On the other hand, the categories like Seed Flour, Jackfruit Pulp, Dehydrated Jackfruit, and Canned Jackfruit Bulb are the categories which are expected to witness a higher growth in coming years, mainly driven by export markets (US, UK, and Germany, etc.). For these markets, the moderate growth rate of ~8% per annum has been considered to project the market estimates for the upcoming years. These product categories provide opportunities for the processing industry in the near to long term. The estimate market size of jackfruit products as described below:



Based on the above estimate about the jackfruit products' market size in India, further projections have been provided till 2025-26.

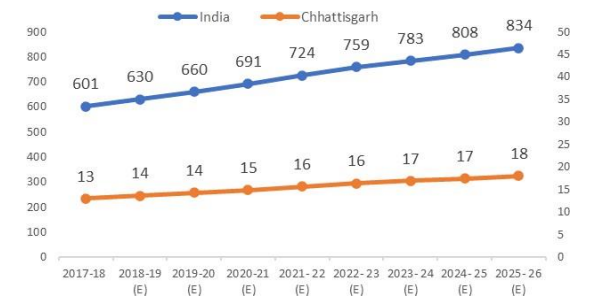
Market size of Jackfruit products in India (in ₹ Crore)

Product	2017-18	2018-19 (E)	2019-20 (E)	2020-21 (E)	2021-22 (E)	2022-23 (E)	2023-24 (E)	2024-25 (E)	2025-26 (E)
Chips	600.96	629.69	659.78	691.32	724.37	758.99	783.28	808.35	834.21
Papad	325.52	341.08	357.38	374.47	392.37	411.12	424.28	437.85	451.87
Seed Flour	150.24	157.42	164.95	172.83	181.09	189.75	204.93	221.32	239.03
Jackfruit Pulp	62.6	62.6	62.6	62.6	62.6	62.6	67.61	73.02	78.86
Dehydrated Jackfruit	25.04	25.04	25.04	25.04	25.04	25.04	27.04	29.21	31.54
Canned Jackfruit Bulb	12.52	13.12	13.75	14.40	15.09	15.81	17.08	18.44	19.92
Others	75	83	91	100	109	118	125	132	140
Total	1252	1312	1375	1440	1509	1581	1649	1721	1796

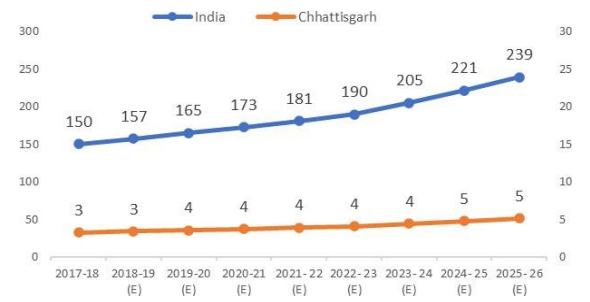
Assumptions: *Some adjustments have been made in the classifications (naming) of the product categories, based on inputs from primary respondents, wherein Pickles, Marmalade, Jam have been classified into 'Others' category*

Market Growth of jackfruit products

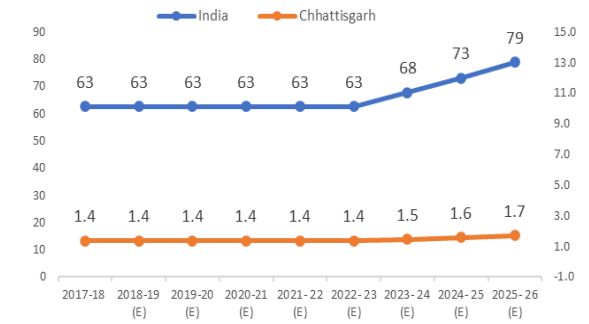
Jackfruit Chips (In Crores)



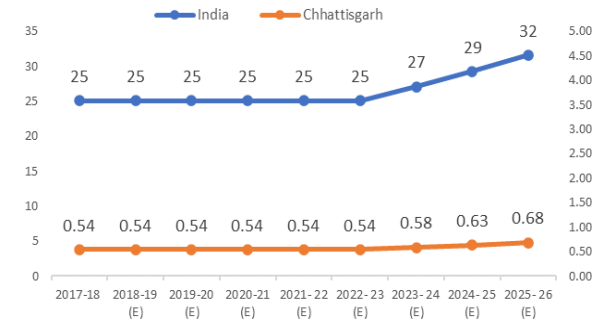
Jackfruit Seed flour (In Crores)



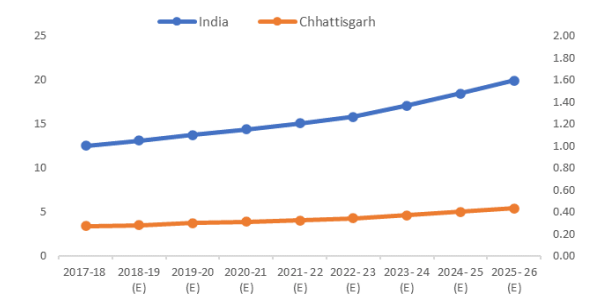
Jackfruit Pulp (In Crores)



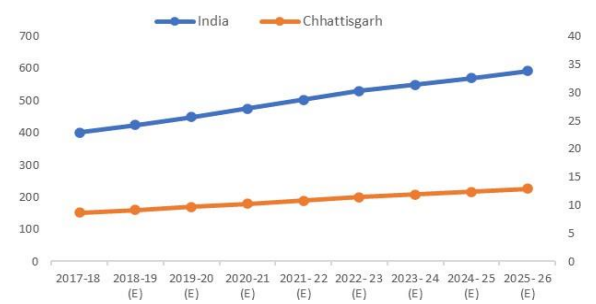
Dehydrated Jackfruit (In Crores)



Canned Jackfruit Bulb (In Crores)



Other Jackfruit products (In Crores)



In market estimates, the volume terms have been arrived at based on the average prices of price category as per primary interactions with suppliers and also cross verification with companies /channels offering these products. The below table provides the market estimates for jackfruit products in volume terms.

Market size of Jackfruit products in India (in MT)

Product	2017-18	2018-19 (E)	2019-20 (E)	2020-21 (E)	2021-22 (E)	2022-23 (E)	2023-24 (E)	2024-25 (E)	2025-26 (E)
Chips	24,038	25,187	25,623	26,066	26,516	26,974	27,027	27,079	27,132
Papad	21,701	22,739	23,132	23,531	23,938	24,352	24,399	24,446	24,494
Seed Flour	3,339	3,498	3,559	3,620	3,683	3,746	3,928	4,119	4,319
Jackfruit Pulp	3,130	3,130	3,039	2,950	2,864	2,781	2,916	3,058	3,206

Market size of Jackfruit products in India (in MT)									
Product	**2017-18**	**2018-19 (E)**	**2019-20 (E)**	**2020-21 (E)**	**2021-22 (E)**	**2022-23 (E)**	**2023-24 (E)**	**2024-25 (E)**	**2025-26 (E)**
Dehydrated Jackfruit	501	501	486	472	458	445	467	489	513
Canned Jackfruit Bulb	835	875	890	905	921	937	982	1,030	1,080
Others	5,008	5,527	5,893	6,258	6,622	6,985	7,188	7,398	7,613
Total	58,552	61,456	62,621	63,803	65,002	66,220	66,907	67,618	68,356

Note:

- *The market volumes have been arrived by considering market value and prices of products. The prices considered for estimation have been considered as: Chips: ₹250 per kg; Papad: ₹150 per Kg, Seed Flour: ₹450 per Kg; Jackfruit Pulp: ₹200 Per Kg; Dehydrated Jackfruit: ₹500 per Kg; Canned Jackfruit Bulb: ₹150 per Kg; Others (Pickles, Marmalade, Jam): ₹150 Per Kg.*
- *A 3% yearly increase in market prices have been considered every year, for estimation of production volumes.*

Based on the above analysis, the estimated market size and potential of jackfruit value added products are already provided in previous section. There are various brand available in market for jackfruit value added products. During interaction with top brands manufactures, they have not provided the critical information related to turnover, market share and market size of their products. Based on the secondary analysis the name of top brands and their market price are detailed below:

Brand wise specific Price of Products:

The Brand wise market price of various of products of Jackfruit are provided below[21]:

Jackfruit Chips and flakes

S. N	Brand Name	Unit	Price in INR
1.	Nutsara Jackfruit Chips	kg	962
2.	Safe Products	kg	1076
3.	We Care Eco Products	kg	1156
4.	Worth 2 Deal	kg	938
5.	Flavours of Calicut	kg	1032

1. Jackfruit Pulp

S. N	Brand Name	Unit	Price in INR
1.	Akshaj Foods	kg	290
2.	Fresho	kg	195
3.	Arasan	kg	200
4.	Limra	kg	180

2. Jackfruit seed powder

S. N	Brand Name	Unit	Price in INR
1.	Law	kg	1196
2.	Arasan	kg	700
3.	B&B Organics	kg	880
4.	SAARA	kg	990

3. canning of Jackfruit Bulb

S. N	Brand	Unit	Price in INR
1.	Jacme	kg	450
2.	Agrozee Fresh	kg	200
3.	Troppy Foods	kg	100

4. Dehydrated Jackfruit

S. N	Brand	Unit	Price in INR
1.	Hillten	kg	475
2.	Durva	kg	600
3.	Jagan	kg	350
4.	Vembanattu Foods	kg	450

In Chhattisgarh

The consumption of Jackfruit in Chhattisgarh is mainly as a fresh fruit used for cooking as a vegetable. The scope for processing and value addition in Jackfruit exists for multiple products in the current scenario. Some of the common value-added products consumed include Chips, Brined products, Jam, Jelly, Jackfruit seed powder, etc. Based on raw material availability in the state, it has a great potential for commercial processing. The farming communities are slowly becoming aware of the potential importance of jackfruit and its value addition to their food and livelihood security. Mainly small-scale industries are processing the fruit for value addition, under cottage industry.

Market size for Processed Jackfruit Products in Chhattisgarh (in ₹ crore)									
Product	2017-18	2018-19 (E)	2019-20 (E)	2020-21 (E)	2021-22 (E)	2022-23 (E)	2023-24 (E)	2024-25 (E)	2025-26 (E)
Chips	12.93	13.55	14.20	14.87	15.59	16.33	16.85	17.39	17.95
Papad	7.00	7.34	7.69	8.06	8.44	8.85	9.13	9.42	9.72
Seed Flour	3.23	3.39	3.55	3.72	3.90	4.08	4.41	4.76	5.14
Jackfruit Pulp	1.35	1.35	1.35	1.35	1.35	1.35	1.45	1.57	1.70
Dehydrated Jackfruit	0.54	0.54	0.54	0.54	0.54	0.54	0.58	0.63	0.68
Canned Jackfruit Bulb	0.27	0.28	0.30	0.31	0.32	0.34	0.37	0.40	0.43
Others	1.62	1.78	1.96	2.14	2.34	2.54	2.74	2.96	3.20
Total	26.9	28.2	29.6	31.0	32.5	34.0	35.5	37.1	38.8

Assumption: *The population proportion of Chhattisgarh has been used on the Indian market to estimate the market size of Chhattisgarh. The population of India has been considered as 136.64 Crore and Population of Chhattisgarh as 2.94 Crore*

In terms of consumption volumes, for jackfruit value-added products, Chhattisgarh is a small market, though it contributes to around 10% of the total raw material (jackfruit) production Pan India. The below table provides an estimate of the market size of jackfruit products by volume for the state.

Market size for Processed Jackfruit Products in Chhattisgarh (in MT)									
Product	2017-18	2018-19 (E)	2019-20 (E)	2020-21 (E)	2021-22 (E)	2022-23 (E)	2023-24 (E)	2024-25 (E)	2025-26 (E)
Chips	517	542	551	561	571	580	582	583	584
Papad	467	489	498	506	515	524	525	526	527
Seed Flour	72	75	77	78	79	81	85	89	93
Jackfruit Pulp	67	67	65	63	62	60	63	66	69
Dehydrated Jackfruit	11	11	10	10	10	10	10	11	11
Canned Jackfruit Bulb	18	19	19	19	20	20	21	22	23
Others	108	119	127	135	142	150	155	159	164
Total	1,260	1,322	1,347	1,373	1,399	1,425	1,440	1,455	1,471

There is a scope of establishing jackfruit processing unit in Chhattisgarh based on sufficient availability of fruit in different production clusters, from where the high growth niche products (Jack Pulp, Jack Seed Powder, Dehydrated Jackfruit, Canned Jack Bulb) can be catered to the demand within and outside the state. The target markets for these products from Chhattisgarh could be the urban consumers of Raipur, Ranchi, Patna, and distant urban markets in other states. Also, key suppliers from south India view export markets as the lucrative destination for some of these products including jackfruit seed powder and dehydrated jackfruit, export-oriented processing can provide an attractive business opportunity to the processing unit in Chhattisgarh.

Consumption pattern of Jackfruit

There is a paucity of authentic reference material on Jackfruit market size. Jackfruit market size may be divided into markets available in Rural and Urban areas. In India, it was calculated that the total Jackfruit consumption under the fruit category was 3,06,122 tons. The market size for Chhattisgarh is estimated to be 1,882 tons.

Jackfruit consumption estimation	
Jackfruit as a fruit	**Unit in Ton**
Rural Consumption - India	2,69,920
Urban Consumption - India	36,202
Total Consumption - India	3,06,122
Rural Consumption - Chhattisgarh	1,882
Urban Consumption - Chhattisgarh	0
Total Consumption - Chhattisgarh	1,882

Source: *Census of India (2011), Household Consumption of Various Goods and Services in India (2011-12), Ministry of Statistics and Programme Implementation, Government of India, 2014*

1.1. SWOT Analysis

Strengths

- Favourable agro-climatic conditions for cultivation of Jackfruit
- Production of approximately 2,10,000MT of Jackfruit in the year 2019-2020 in the state
- Production of Jackfruit happens in all the 27 districts of Chhattisgarh
- Proximity of the state to Amritsar-Kolkata Industrial Corridor and East coast Industrial Corridor
- With approximately 45% of the state covered with forest cover and presence of multiple rivers, the state has natural resources in abundance to support the industry
- Growing health related awareness and acceptability of Jackfruit by the consumers
- Growing environment related awareness and comparatively similar taste of Jackfruit as of pork

Weakness

- Inadequate facilities for post-harvest handling of Jackfruit
- The pulping of Jackfruit is still done manually
- Considerable quantities of raw material is wasted at the source itself
- Upgradation of technology for processing of raw material
- The bulkiness of the fruit and high transportation costs may lead to disinterest of an entreprenuer in Jackfruit
- High perishability of Jackfruit and lack of storage facilities may lead to low capacity utilisation of the plant

Opportunities

- Scope for improving industrial infrastructure to attract more investments
- Incentives provided by the government to promote processing of Jackfruit
- The huge availability of processing quality produce is the big opportunity for the state
- The increasing awareness of Indian Consumer health orientation, and export orientation of the produce has given further impetus to the consumption of ayurvedic products in the food plate

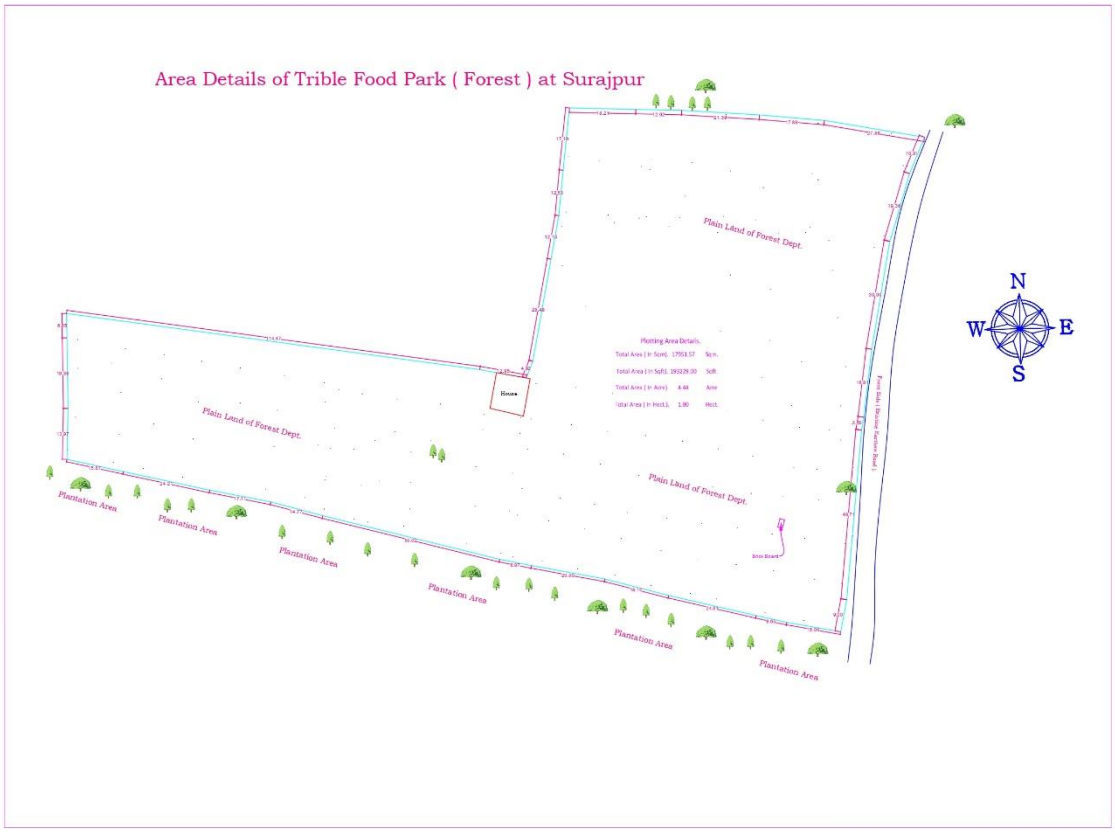
Threats

- Less support in terms of research & development of the product may cause the private entities to invest in other high value products
- Possibility of ecological imbalance because of illicit felling of trees

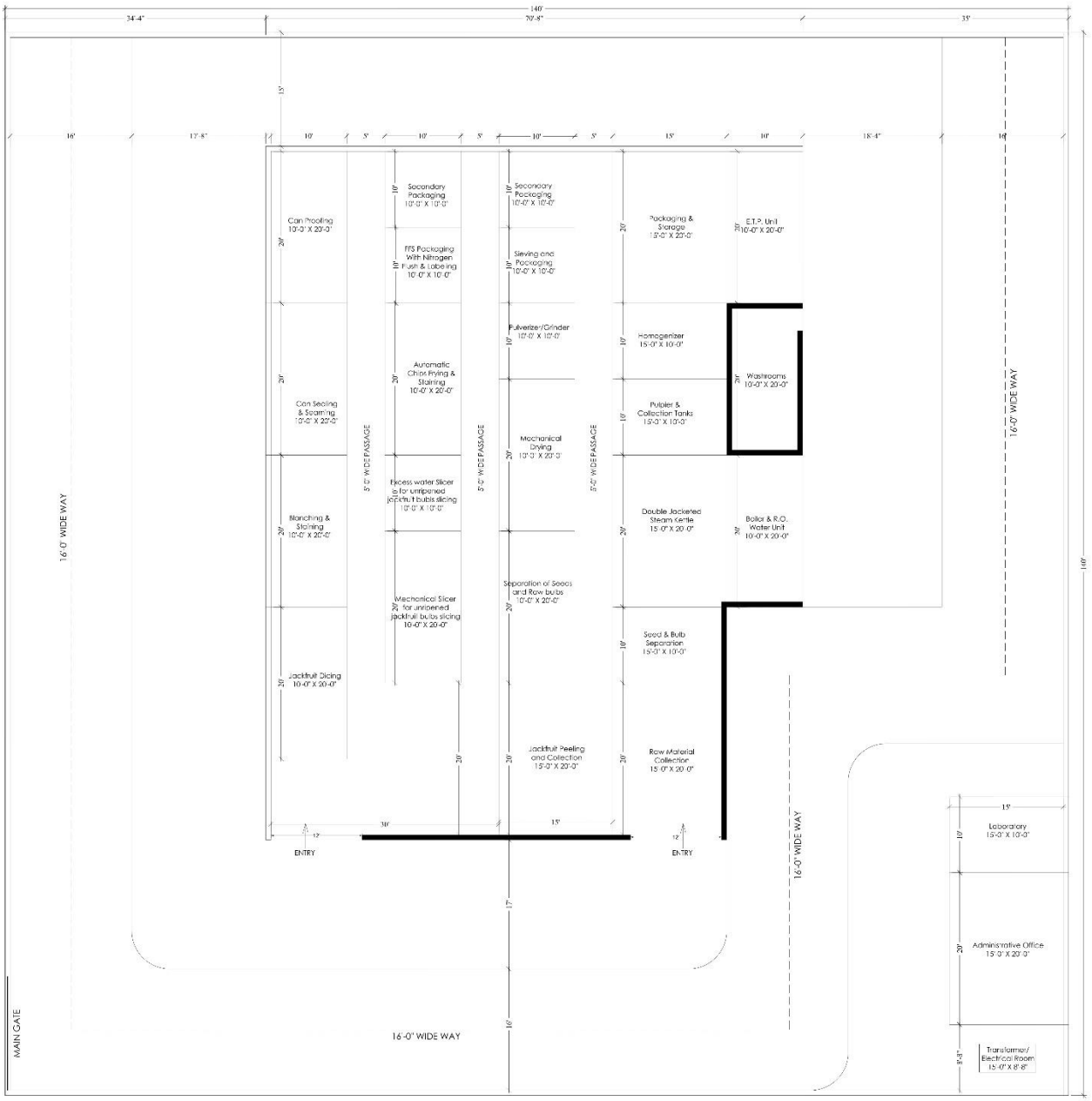
CHAPTER 4: LOCATION AND INFRASTRUCTURE

The envisaged plant will be set up by Chhattisgarh Government State Minor Forest Produce Cooperative Federation Limited, Chhattisgarh at the site mentioned.

- Site is located at Khasra No. 100/1 at Village-Patrapara, Dist-Surajpur, Chhattisgarh.
- External Infrastructure such as Boundry Wall, Connecting Roads and Necessary utilities connection etc. will be constructed by CGMFP Federation.
- Internal Boundry walls & Processing unit roads shall be constructed by the processing unit party along with other construction.



Site Photographs



TENTATIVE PLAN LAYOUT FOR JACKFRUIT PROCESSING

NOTE:-
1. ALL DIMENSION ARE IN INCH UNLESS STATED OTHERWISE
2. THE DRAWINGS ARE TO BE SCALED ONLY WRITTEN DIMENSIONS TO BE FOLLOWED.
3. ANY DISCREPANCY OBSERVED SHOULD BE IMMEDIATELY BROUGHT TO THE CONSULTANTS NOTICE.

DRG. No.:- - *ARC/01*
REV. No.:- - *R4*
Date :- - *28 FEB 2023*
Drawn By :- -
Checked By :- -
Architect :-

Client :-
CGMFPFED NAYA RAIPUR (C.G.)

Title :-

CHAPTER 5: TECHNOLOGY

As described in earlier sections, there is a good scope for setting up jackfruit processing unit for processing into different value-added products, which not only will help the farmers to utilize the perishable raw material and generate more employment opportunities but also fulfill the needs of consumers. In this section, the manufacturing process of various value- added products through jackfruit processing has been elaborated for the proposed processing unit.
These Products and their processing technology are developed with the collaboration of Experts.

Jackfruit based value-added products has abundance nutrition and medicinal properties. There are standard technologies to produce jackfruit-based value-added products.

Product Processing Technology is the whole proprietary of the CGMFP Fed. This will be shared at the time of mutual agreement with all terms and conditions.

- Canned Jack Bulb
- Dehydrated Jackfruit
- Jackfruit Seed Flour
- Jam
- Squash
- Chips & Flakes
- Jackfruit Pulp

Technical Specification for Finished Products:

Several types of products can be produced from various stages of Jackfruits. Nutritive value per 100g will be as below:

Nutritive value of various finished products of Jackfruit			
Nutrients	**Young fruit**	**Ripe fruit**	**Seed**
Water (g)	76.2-85.2	72.0-94.0	51.0-64.5
Protein (g)	2.0-2.6	1.2-1.9	6.6-7.04
Fat (g)	0.1-0.6	0.1-0.4	0.40-0.43
Carbohydrate (g)	9.4-11.5	16.0-25.4	25.8-38.4
Fiber (g)	2.6-3.6	1.0-1.5	1.0-1.5
Total sugars (g)		20.6	
Total minerals (g)	0.9	0.8-0.9	0.9-1.2
Calcium (mg)	30.0-73.2	20.0-37.0	50.0
Magnesium (mg)	NA*	27.0	54.0
Phosphorus (mg)	20.0-57.2	38.0-41.0	38.0-97.0
Potassium (mg)	287.0-323.0	191.0-407.0	246.0
Sodium (mg)	3.0-35.0	2.0-41.0	63.2
Iron (mg)	0.4-1.9	0.5-1.1	1.5
Vitamin A (IU)	30.0	175.0-540.0	10.0-17.0
Thiamine (mg)	0.05-0.15	0.03-0.09	0.25
Riboflavin (mg)	0.05-0.2	0.05-0.4	0.11-0.3
Vitamin C (mg)	12.0-14.0	7.0-10.0	11.0
Energy (kJ)	50-210	88-410	133-139

CHAPTER 6: FINAL PRODUCTS

For jackfruit processing, there are different technologies available in the market, involving different degree of manual and automatic processes. The proposed unit will produce four products and for each product, the plant and machinery has been proposed based on discussions with suppliers and research about their products. This section provides the reasons for selection of particular technology in the machine assembly for the proposed unit.

Jackfruit Pulp Extraction

For extraction of pulp from jackfruit, there are different technologies available. Each technology has its own advantages and disadvantages. The common technologies are rotary modern twin pulping and single sieve pulping. To get the best pulp from jackfruit, the rotary modern twin pulper machine is proposed for the processing unit which uses a central rotation shaft equipped with blades and provides a more rotational effect to the product taken for processing and better product recovery. Motorization also rotates the central rotation shafts. The technology saves labour and times and maintains product hygiene. On the other hand, the single sieve pulper technology involves working with single sieve and the quality of the pulp is not good compared with the rotary modern twin pulping. It is more manual operated, hence less efficient in terms of hygiene maintenance and saving in time and labour.

Through jackfruit pulp, Jam and squash can also be produced based on the demand and requirement.

Jackfruit Canning

In the case of canning of jackfruit, the process differentiates at the canning stage only. There are mainly two types of kettles used, one is a steam jacketed kettle, and another is a tilt kettle. We are proposing steam jacketed kettles, wherein steam jacketed pots are operated at 50 psi as the maximum pressure. A boiler usually supplies desired amount of steam to this steam jacketed kettles. A steam jacketed kettle is a container with a spherical bottom with jacket covering to provide space for steam to circulate. The steam condenses on the product-surface of the kettle jacket and transfers its latent heat of vaporization to the product, thereby heating the cooking surface. The steam Kettle is complete with a pressure gauge, safety valve and steam trap. The kettles are double jacketed for maximum steam utilization and better efficiency. To produce canned jackfruit, therefore steam kettle is considered better. Also, the steam kettle does not need to be revolved again and again. On the other hand, the kettle must change again after one shift of processing and thus increases the change-over time.

Jackfruit Seed Powder

For processing of Jackfruit seed powder, there are many pulverisers available in the market, which includes semi-automatic and manual micro pulveriser. Both machines are used for grinding seeds, but we are proposing a semi-automatic pulveriser because it is a high-speed swing beater type grinding machine and has more efficiency than the manual micro pulveriser. Semi-automatic pulverization works on impact of beater on the material in the grinding chamber while the manual micro pulveriser uses screen to generate the fine particles from seed. In the semi-automatic pulverization, the fine powder is swept by the

suction of the blower from the grinding chamber through whizzer blade and cone. The function of the whizzer blade and cone is to check the oversize particles and thus regulates the mesh size by shifting the whizzer blade to the cone side. The function of the blower is to deliver particles to the cyclone where particles are separated from the air by the centrifugal force developed in the cyclone. The powder is discharged by the cyclone outlet and the separated air returns to the grinding chamber by semi round bend. It has a high-speed rotor assembly of two-way reversible beaters. Automatic pulveriser has an easy access because of its dual access doors. They also have silent running with dust free operations, which helps them to be durable. It also guaranteed grinding efficiency, particle sizes are finer and more uniform than that obtained from a machine using a screen.

Dehydrated Jackfruit

There are drum drying technique and solar drying techniques available in the market. We are proposing solar dryers for dehydrating jackfruits because it has a uniform drying capacity and gives better dehydrated products. When the solar radiation impinges on the glass cover, the air is heated up and then introduced inside the drying chamber. Raising the temperature of the air has a direct effect on the product by removing its moisture content by evaporation and increasing its temperature. It also dries faster because inside the dryer it is warmer than outside. It also gives less risk of spoilage of product and protects against flies, pests, rain, and dust. It also helps in saving labour and the quality of the product is better in terms of nutrients, hygiene, and colour.

CHAPTER 7: PLANT AND MACHINERY

Technical Specifications for Plant & Machinery for Jackfruit Processing Unit

The following table has summarized the technical specifications of plant and machinery used in processing unit. Some of these machines shall have a common use for all four products which shall include processes of Washing, Blanching, Control panel for controlling the unit, RO plant etc. The details of technical specifications have been mentioned here.

Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
Feeding Hopper Cum Washer	• The parts of machine are made of stainless steel with simple design and sturdy construction. • The machine has hopper for feeding the raw material continuously, which gets washed by slow tumbling action. • **Capacity** – 1 MT/Hour • **Power** - 2.4 kW	
Working Table	• The working table is made of stainless steel with a simple design. • **Length**- 6 feet • **Width**- 2 feet • **Height** –3.5 feet • **Required Nos. of Table- 8**	
S/S Trays	The S/S Trays are made of stainless steel with a simple design. • **Finish**- Mirror Finish • **Required Nos. of Trays**- 50	
Plastic Crates	• Plastic Crates made of plastic. • **Capacity** - 20 to 25 Kgs • **Shape** -Rectangular • **Size** -540x360x290mm • **Required Nos.** - 200	

Large Cutting Knives	• Blade Material made of Carbon Steel • **Colour-** Black • **Handle Material-** Wood, Steel, Iron • **Blade Edge-** Plain • **Required Nos.** - 20	
Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
Blancher	• S.S. Drum & Body and other frames are made by MS. • **Production Capacity -**200KG/Hour • **Motor-2 HP** • **Type-** Continuous • **Power- 2 kW** Usage: The Blancher is a versatile machine which is designed for heating and cooking a variety of food products.	
Steam Jacketed Kettle of Stainless-Steel Construction	• Mounted on stainless steel legs. Jacket and pan made of 10/12 Standard Wire Gauge stainless steel. Complete with pressure gauge, safety valve, steam Trap. The kettles are double jacketed for maximum steam utilization and efficiency. • Kettles fixed type with Teflon scrapper fitted with geared motor completely made of stainless steel (legs, mounting etc.) • **Capacity:** 200 litres • **Surface Finish-** Mirror Finish Usage: Steam-jacketed kettles are often used to rapidly and uniformly heat food and agricultural products to processing temperatures.	

Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
Slicer	• The machine can slice jackfruit bulbs into uniform-sized slices. • Made of stainless steel • **Capacity**- 750kg/day • **Space required**- 50 Sq. Ft. • **Required Nos.** - 4	
Filling Tank	• Made of Stainless steel, SS-304 • **Capacity** – 500-1000 Litres. • Insulated for maintaining the inside temperature	
Semi-automatic can sealer machine	• **Capacity:** 35 Cans Per Minute • **Power:** 2.5 Hp • **Machine Type**: Semi-Automatic • **Motor Speed** -1440 rpm • **Net Weight** -850Kg • **Voltage** - 440V	
Pulper	• Consists of 2 Nos pulper mounted on the basic structure of M.S. 1ststage is fitted with a sieve. The product gets pulped in the 1st stage & then flows into the 2nd stage, which is fitted with a sieve (as per requirement). All contact parts made of stainless steel AISI-304. • **Stages** -2 • **Automation Grade-** Semi-Automatic • **Voltage** -440v • **Electricity Phase**-Three Phase • **Capacity-** 2.5/3 tonnes /hrs	

Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
	• **Total load-** 7.5 HP	
Pulveriser	• **Material-** Stainless steel • **Power**- 7.5 HP • **Electricity Phase-** 3 Phase Motor • **Capacity** –250 kg per hour. • **Automatic Grade**- Semi automatic **Use:** A pulveriser or grinder is a mechanical device for the grinding of many different types of materials.	
Solar Dryer	• Operating Temperature: 50-60^0 C • Feature: With electric heater as back up, controlled by digital Temperature controller with PT-100 sensor • Base Area- 12 x 30 feet • Capacity- 300 kg/ batch	
Or		
Mechanical Dryer	Mechanical Tray Dryer • Material- Mild Steel • Automation Grade- Automatic • Capacity- 24 tray dryer. • Heating Media - Electric	
Masala Coating Machine	• The Masala Coating Machine is made of a Stainless-steel body. • **Capacity** -100 kg / hrs • **Operation Mode-**Automatic	

Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
	• **Electricity Connection** -Three Phase • **Motor Power** -2 HP • **Required Nos.** - 1	
PS-RO PLANT	• **RO Capacity-** 2000LPH • **Purification Type-** RO • **Features-** Fully Automatic • **Automation Grade-** Automatic • **Power Source** -AC • **Power-** 10-12 kW	
Frozen storage	• **Temperature:** -18-25 Degree C • **Phase-** 3 Phase • **Compressor Type-** Air Cooled • **Size of Storage-** 1500 cubic feet • **Capacity** -20 tonnes • **Temperature-** 2^0C to 8^0C • **Humidity-** 85% - 90% • **Power:** 12-15 kW	
Boiler	• **Power Source-** Electric • **Automation Grade-** Automatic • **Power Consumption:** 5 kW 3 Phase • **Capacity-** 600 (kg/hr) • **Weight**-1200 kg	

Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
Plate chiller	• **Capacity-** 2 Ton • **Power** -440 V • **Phase** -3 Phase • **Material-** Stainless Steel • **Frequency** - 60 Hz Use: plate chillers are used for pulp packing to 5 -10 kg and it has specially used to preserve pulp without chemical mixing at cold storage.	
Automatic chips frying machine	• **Material**- Stainless Steel • **Driven Type-** Automatic • **Capacity** -300kg/h • **Power Consumption** - 3 HP • **Machine Components** - Fryer	
Jackfruit Seed Grinder	• This is used for fine grinding of jackfruit seeds into powder. • **Weight**- 50 kg • **Voltage**- 220V • **Capacity-** 100 Kg/Hr • **Power-3.5** HP Motor	
FFS machine with nitrogen flush	• This is a Semi-Automatic pneumatically operated vacuumizing, sealing and enhance the product self-life. • **Power Supply-** 220 V AC, Single Phase, 50 Hz • **Power Consumption-** 1.8 kW • **Filling range-** 25 gm – 500 gm • **Phase-** 1 Phase	

Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
	• **Packaging Speed-** 35-40 Pouch/Min	
Homogenizer	• **Pressure-** 100-150 Bar • **Voltage** - 380 volt • **Capacity-** 100-1000 litres/hour • **Phase-**3 phase. • **Automation Grade-** Semi-Automatic • **Power-** 5 HP Use: Homogenizer is a special equipment of the liquid material thinningand high-pressure transportation.	
DG Set	• **Electric Power-** 50 kVA • Alternator- Brushless, Single Bearing, IP23, Class H Insulated, 50 Hz, Voltage Regulation +- 0.5%, 0.8PF Lag • **Size-** 2000 X 900 mm	
Effluent Treatment Plant	• **Working Voltage Range** -440 V 3 Phase • **PH Level-** 6 to 8 • **Operating Temperature-** 25 to 50 degrees Celsius • **Operating Pressure-** up to 3 bar • **Feed Flow Rate-** 0.5 to 2 m3/hr • **Dimension** -4ft* 3.2ft*4ft • **Power-** 1.5 to 2.5 KW	

Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
Transformer	• Capacity – 100 kVA • Input Voltage- 300-460 Volt • Cooling Type- Oil cooled. • Phase- 3 Phase • Frequency- 50-60 HZ • Carbon Rollers- High Grade Graphite Rollers	
Pallet jacks	• **Fork Length-** 1150 mm • **Fork Width-** 550 mm • **Capacity**- 2 ton	
Carton rapping machine	• **Strap Width-** 12 mm • **Wight**- 210 Kg • **Material**- Mild Steel • **Speed**- 25 Cycle/Min	
Bag Closer Machine	• **Frequency**- 50 Hz • **Voltage**- 220V. • **Needle** – Double • **Capacity-** 25-30 Bag/Min • Carton strapping and taping machine	
Manual bag closer machine	• **Capacity:** 5-8 bags per min. • **Voltage** - 220V • **Stitch Type** - Single Thread/Chain Stitch • **Weight** -6 Kg	

Specification of Plant & Machinery		
Equipment Name	**Description of Machine and Specification**	**Diagram**
Laboratory	**List of equipment** • Laminar Air Flow • Microscope • Oven • Incubator • Refractometer (0 – 32^0B, 28-62^0B & 58-90^0B) • Salinometer (0-100%) • Pressure tester • PH Meter • Weighing Balance (mg to g) • Other equipment (Petri dish, Burner, inoculating needle, Chemicals, Microorganisms growing media, test tube, beaker, flask etc)	

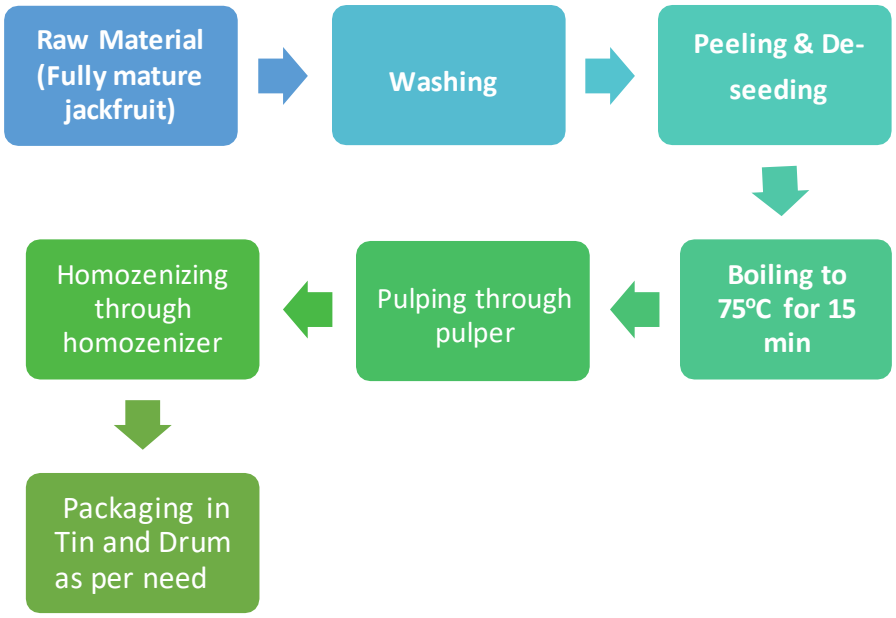
VENDORS" NAME AND ADDSRESS

The key suppliers of plant and machinery are mainly located outside the state of Chhattisgarh and some of these players have PAN India services. The below list provided the details of suppliers of jackfruit processing plant and machinery:

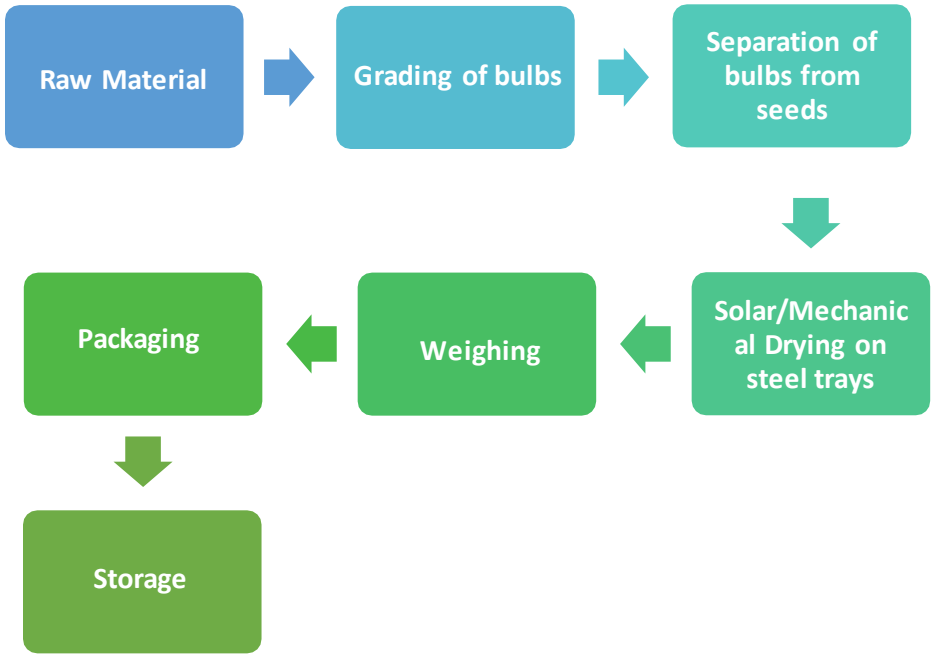
Key suppliers of Processing Plant & Machineries			
S. N	**Vendor Name**	**Address**	**Contact**
1	IRS Agro Direct	Omkar Apartment, Shaniwar peth, Tal:Miraj, Dist-Miraj, Maharashtra-416410	+91-7057624160
2	S4S Technologies	Plot no 43, Sector 6, Sanpada East, Navi Mumbai 400-705	sales@s4stechnologies.com +91-7738193313
3	Kerala Agro Fruit Products	Elampal, P.O, Punalur, Kerala-691322	(0471) 2471344, 2471345, 2471343
4	Fry-Tech Food Equipment's Private Ltd	S. No. 4, Raviraj Industrial Estate, Bhikhubhai Mukhi Ka Kuwa Bharwadvash, Ramol, Ahmedabad - 380024, Gujarat, India	+91-9016108819, +91-8042952940
5	Hindustan Vibro Tech Pvt Ltd	No. 32 1st Floor, Shivam Square, Swami Nityanand Marg, Sahar Road, Andheri (E), Mumbai – 400069.	+91-8976232172, 0-250-2390081/82
6	Springboard Enterprises India Ltd	1st, 2nd & 3rd Floor, Plot No. 7, 8 & 9, Garg Shopping Mall, Service Centre, Rohini Sector 2 New Delhi – 110085, Delhi, India	+91-8130796171
7	Flour Tech Engineers Private Limited	Plot No. 182, Sector 24, Faridabad - 121005, Haryana, India	+91-9810462578, 0129-4043399
8	P Square Technologies	3, Swami Mahal, Gurunanak Nagar, off. Shankarsheth Road Bhavani Peth, Pune - 411002, Maharashtra, India	+91- 8048762146
9	Ricon Engineers	10 To 13, Bhagwati Estate, Near Amraiwadi Torrent Power, Behind Uttam Dairy, Rakhial, Ahmedabad - 380023, Gujarat, India	+91-9374417121
10	Gemtech Project LLP	10/C, Middleton Row, 3rd Floor, Kolkata-700071, India	(91-33) 2217-7328
11	M/s. Batliboi & Comp Ltd.	Bharat house, 5th Floor, 104 Bombay Samachar Marg, Fort, Mumbai-400001	(022) 66378200

CHAPTER 8: PROCESS FLOW CHART

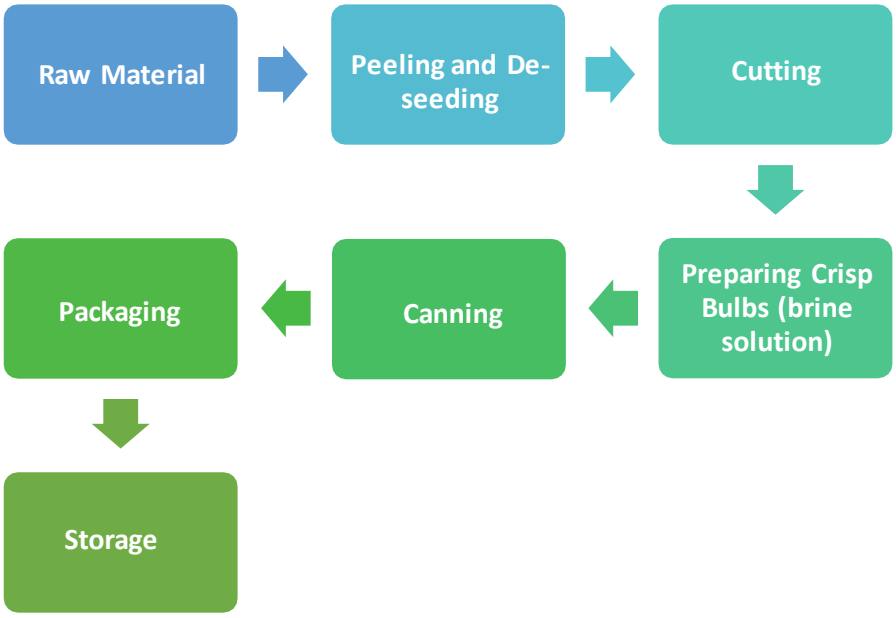
A. Jackfruit Pulp



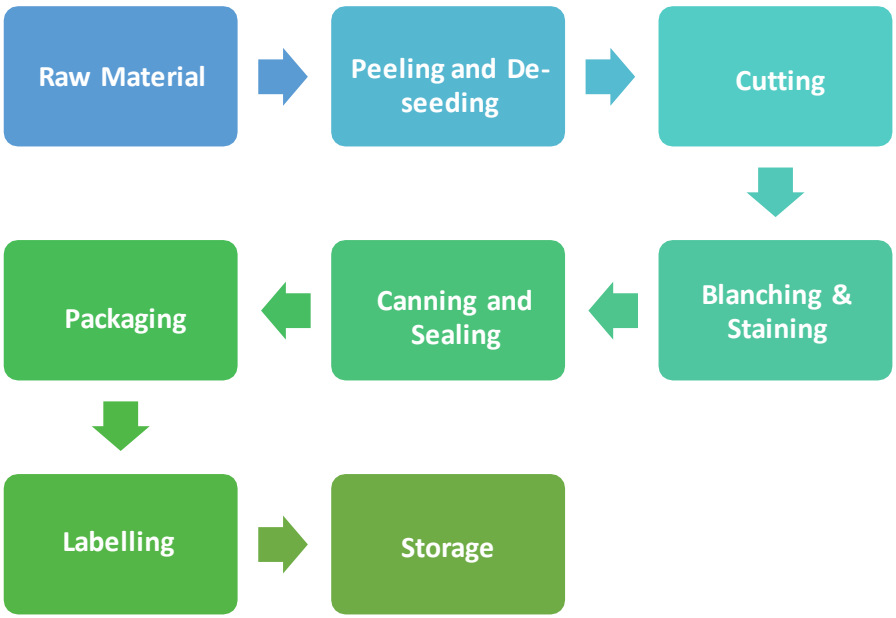
B. Dehydrated Jackfruit



C. Canned Jackfruit pulp

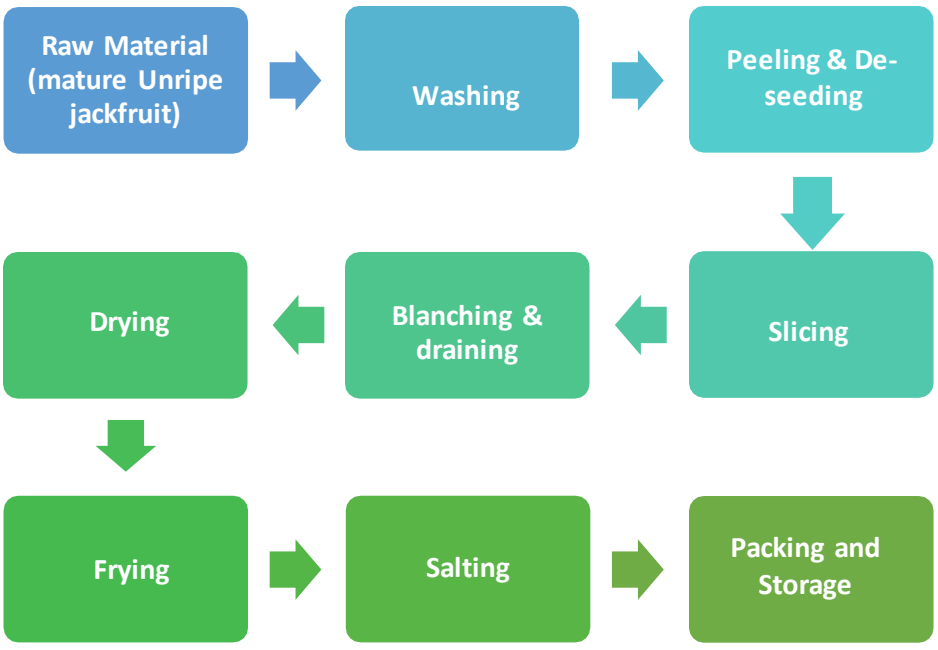


D. Canned unripe Jackfruit.



E. Jackfruit Seed Powder/Flour

F. Jackfruit Chips and Flakes



CHAPTER 09: WORKING HOURS, CAPACITY UTILIZATION& HUMAN RESOURCE

- Working Hours & Capacity Utilization

Working Hours/Days

Working hours per day	=	8.00 (1 Shifts)	Hours
No. of working days in a year	=	150.00	Days

Capacity Utilization from 2023-24 to 2032-33

YEAR ---------->	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33
CAPACITY UTILISATION	50.00%	60.00%	70.00 %	80.00%	90.00%	90.00%	90.00%	90.00%	90.00%	90.00%

Electricity Requirements	**70kW**

Manpower

Workforce Assumptions	Nos.
Semi-Skilled Labour	**20**
Employee Expenses	
Plant Manager	**1**
Food Technologist	**1**
Plant Operator	**2**
Accountant	**1**
Plant Staff	**2**
Security	**3**
Marketing Specialists	**2**

CHAPTER 10: CONSTRUCTION AND BUILDING DESIGN

A. DESCRIPTION OF DESIGN

S. No.	DESCRIPTION OF ITEMS
1	RAW MATERIAL COLLECTION
2	SEED & BULB SEPARATION
3	DOUBLE JACKETED
4	PULPIER & COLLECTION TANKS
5	HOMOGENIZER
6	PACKAGING & STORANGE
7	JACKFRUIT PEELING AND COLLECTION
8	SEPARATION OF SEEDS AND RAW BULBS
9	MECHANICAL DRYING
10	PULVERIZE/GRINDER
11	SIEVING AND PACKAGING
13	SECONDARY PACKAGING
14	MECHANICAL SLICER FOR UNRIPENED JACKFRUIT BULBS SLICING
15	EXCESS WATER SLICER FOR UNRIPENED JACKFRUIT BUBLS SLICING
16	AUTOMATIC CHIPS FRYING & STAINING
17	FFS PACKAGING WITH NITROGEN FLUSH & LOBELING
18	SECONDARY PACKAGING
19	JACKFRUIT DICING
20	BIANCHING & STAINING
21	CAN SEALING & SEAMING

22	CAN PROOFING
23	BOILER & R.O. WATER UNIT
24	WASHROOMS
25	E.T.P.UNIT
26	LABORATORY
27	ADMINISTRATIVE OFFICE

B. AREA STATEMENT

S.NO.	ITEMS	FLOOR AREA
1	PLOT AREA	14576.08 SQ.M.
2	RAW MATERIAL COLLECTION	27.87 SQ.M.
3	SEED & BULB SEPARATION	13.935 SQ.M.
4	DOUBLE JACKETED	27.87 SQ.M.
5	PULPIER & COLLECTION TANKS	13.93 SQ.M.
6	HOMOGENIZER	13.93 SQ.M.
7	PACKAGING & STORANGE	27.87 SQ.M.
8	JACKFRUIT PEELING AND COLLECTION	27.87 SQ.M.
9	SEPARATION OF SEEDS AND RAW BULBS	18.58 SQ.M.
10	MECHANICAL DRYING	18.58 SQ.M.
11	PULVERIZE/GRINDER	9.29 SQ.M.
12	SIEVING AND PACKAGING	9.29 SQ.M.
13	SECONDARY PACKAGING	9.29 SQ.M.

14	MECHANICAL SLICER FOR UNRIPENED JACKFRUIT BULBS SLICING	9.29 SQ.M.
15	EXCESS WATER SLICER FOR UNRIPENED JACKFRUIT BUBLS SLICING	4.92 SQ.M.
16	AUTOMATIC CHIPS FRYING & STAINING	18.58 SQ.M.
17	FFS PACKAGING WITH NITROGEN FLUSH & LOBELING	9.29 SQ.M.
18	SECONDARY PACKAGING	9.29 SQ.M.
19	JACKFRUIT DICING	18.58 SQ.M.
20	BIANCHING & STAINING	18.58 SQ.M.
21	CAN SEALING & SEAMING	18.58 SQ.M.
22	CAN PROOFING	18.58 SQ.M.
23	BOILER & R.O. WATER UNIT	18.58 SQ.M.
24	WASHROOMS	18.58 SQ.M.
25	E.T.P.UNIT	18.58 SQ.M.
26	LABORATORY	13.93 SQ.M.
27	ADMINISTRATIVE OFFICE	27.87 SQ.M.

C. REPORT AND SPECIFICATION

NAME OF WORK	**CONSTRUCTION OF PROPOSED INTEGRATED MAHUA PROCESSING UNIT PATAN DIST. –DURG C.G.**
AUTHORITY	**CHHATTISGARH STATE MINOR FOREST PRODUCE**
PROVISIONS	The Following Provisions has been made in this Estimate :
1.Foundation And Frame	Column and Footing with R.C.C. M-20
2.Plinth	Sand/crusher dust and hard moorum has been/used for filling under floors Ant termite treatment provision has been given below plinth. Brick work with FLY ASH lime bricks in C.M -1:6 has been provided R.C.C. Grade slab at plinth level with M-20 grade of concrete
3.Superstructure	Brick Work with Fly Ash Bricks of crushing strength not less than 25 kg/sq cm R.C.C Slab with M-20 Grade of concrete Poly Carbonate and Profile Sheeting Work with steel structure as per approved make C.G. PWD
4.Flooring & wall tiling	i. Terrazzo flooring with complete polishing and wall tiling up to 900 mm inside the processing area all around with adhesive of approved make as per C.G. PWD
5. Doors	All door frames and shutters of Teak wood frame For main doors and entry in processing area will be of fire proof doors of approved make approved as per C.G. PWD
6. Windows	All windows and ventilators are Aluminum section windows shutters of A class aluminum sections approved in C.G. PWD

7.Steel Work	M.S grills in windows, ventilators and stainless steel railing has been provided in ramp and stair case
8. Plastering	12mm thick plaster for smooth side, 15 mm thick plaster for rough side, 6mm thick plaster for ceiling has been used in this building.
9.Painting	All wood work and steel work is painted with synthetic enamel paints and inner walls are painted with acrylic luxury emulsion (plastic) with putty of A class fire proof materials as per approved C.G. PWD
10. false ceiling	Armstrong false ceiling in all processing unit of approved make as per C.G. PWD

11. Water Supply	Specific item with ISI mark are used
12 Landscape And Road	As per C.G. PWD ROAD 2015
13. Rate	All rates are as per schedule of rates in C.G.P.W.D enforced from 01.01.2015 & Amendment up to 06.04.2016
16.Specification	Work will be executed as per C.P.W.D & National Building Code specification

PROVISIONS	**Following provisions of Electrical Works have been made in this building :**
Type Of Wiring	Concealed type Wiring with Copper Conductor (FRLS) in PVC (Non-Metallic) Conduit Separate wiring and Separate Meter System for each Department

Type of Switch Socket	Modular Type Socket Switch as approved by approved C.G. PWD SOR 2015

PREFABRICATED STEEL Build up Area 26.69 X 17.62 =470.27 Sqm
Canopy Area 18X3.0 = 54.0 Sqm
Providing, Supplying, Designing and Erection of PREFABRICATED STEEL BUILDING - HSN CODE -9406 in site.
THE BUILDING WILL BE MANUFACTURED IN ACCORDANCE WITH THE FOLLOWING CODES:-
IS 800-2007
. A WS D1.1 Structural Welding Code. MBMA Manual for Fabrication Tolenances.
Product Specification
1. PRIMARY MEBMERS:- Primary Structure framing shall include the transverse rigid frams, lean-to-rafters and colulmns, canopy rafters, interior columns (beam and column frames) bearing frame refters and corner columns and end wall wind columns.
2. SECONDARY MEMBERS:- Secondary structure framing shall include the purlins,girts eave struts,wind bracing flags bracing, base angle, clips and outer miscellaneous structure parts.
3. PAINT OF STRUCTURAL MEMBERS:- All structural members shall be cleaned by wire brushing to move dirt, grease , oil and loose mill scale and give one shop coat of red oxide, air doing ,phenol modifeed alkyd resin primer .

4. CONNECTIONS:- All field connections shall be bolted (unless othewise notes). Primary bolted connections shell be furnshed with high stength bolt informing to the physical specifications of ASTM A 325 (Or equivalent). Secondary bolted connection shall be furnished with machine bolts confirming to the physical specification of ASTM A307 (Or eqauivalent).
5. PHYSICAL SPECIFICATIO OF STRUCTURAL MEMBERS:- Member fabricated from plate or bar stock shall have flanges and webs jointed on one side of the web by a continuous welding process and will conform to the physical specifications of ASTM A570 (Grade 50) or equivalent and having a minimum yield strength of 50,00 P.S.I (345 MPa).
members fabricated by cold forming process shall conform to the physical specifications of ASTM A570(Grade 50) or equivelent and having a minium yield strength of 50,000 P.S.I. (345 Mpa).
Members fabricated from hot rolled strucural shapes shall conform to the physical specifications of ASTM A572 (Grade 35) or equivalent and having a minimum yield strength of 36,000 P.S.I. (250 Mpa).
Rod and angle bracing shall conform to the physical specification of ASTM A36 (or equivalent) and having a minimum yield strength of 36,000 P.S.I. (250 Mpa).
Roof and wall cladding shall conform to the physical specifications of ASTM A653 grade 50 (or equivalent) and having a minimum yield strength of 50,000 P.S.I. (345 Mpa).
All other miscellaneous secondary members shall have minimum yield strength of 36,000 P.S.I. (250 Mpa).
6. ROOF SHEETING (KR)/WALL SHEETING (KW) :- Roof and wall panels shall be of 26 gauge thick profiled galvalume or galvalume color coated steel sheeting.
In case of pre-painted galvalume panels, the exterior face is pre-painted with 1mil. Thick factory applied polyester paint.The interior face is pre-painted with 0.5mil. Thick factory applied polyester paint.
Each panel shall provide one meter coverage and can be shipped in any length up to 10 m. color of exterior and interior faces shall be

white/grey or as directed. Other materials, thicknesses and coating are available upon request.
The material shall conform to ASTM A792 and the galvalume coating to ASTM-A792-AZ150 . The yield strength of material shall be 550/300 mpa. Incase of KSS type of sheeting the yield strength shall be 300 mpa (minimum) .
7. SHEETING FASTENERS :- Standard fasteners shall be NO. 14, Type A, self tapping sheet metal screws with metal and neoprene washers. All screws shall have hexagonal heads , be color coated to match roof and wall sheeting and made of zinc plated steel.
8.SEALER/ROPE SEAL:- Thise is to be applied at all side laps and end laps of roof panels and around self flashing windows. Sealer shall be 6mm wide X 5mm thick , asbestos fiber filled, pressure sensitive butyl tape. The sealer shall be non asphalted, non shrinking,non drying and non toxic and shall have superior adhesion to metals, plastic and painted surfaces at temperatures from - 51 deg. 'C' to + 104 deg 'C' .
9. CLOSURES/FILLER STRIPS :- Solid or closed cell E.T.P. (Ethylene polypropylene Terpolymer) closures matching the profile of the panel shall be installed along the eaves, rake and other locations specified on drawings.
10. RIDEGE CAP :- A formed panel matching the material color, slope and profile of adjoining Rib roof panels.
11. FLASHING AND TRIM :- Flashing and /or trim shall be furnished at the rake, corners, eaves framed openings and wherever necessary to provede weather tightness and finished appearance. Color shall be white for rake and eave flashings unless otherwise specified by client from one of the standard range of colors. Material shall be 26 G thick conforming to the physical specifications of ASTM A446 Grade C or equivalent and having minimum yield strength of 40,000 P.S.I. (275 MPa).
12. EAVE GUTTERS AND DOWNSPOUTS :- Eave gutter shall be box shaped, color coated, and 0.5mm nominal thickness (26 gauges) galvanized steel . The outside face of the gutter shall be supported with color coated 0.5 mm nominal thickness (26 gutter) galvenized straps to the eave member at a maximum spacing of 1.2 m.

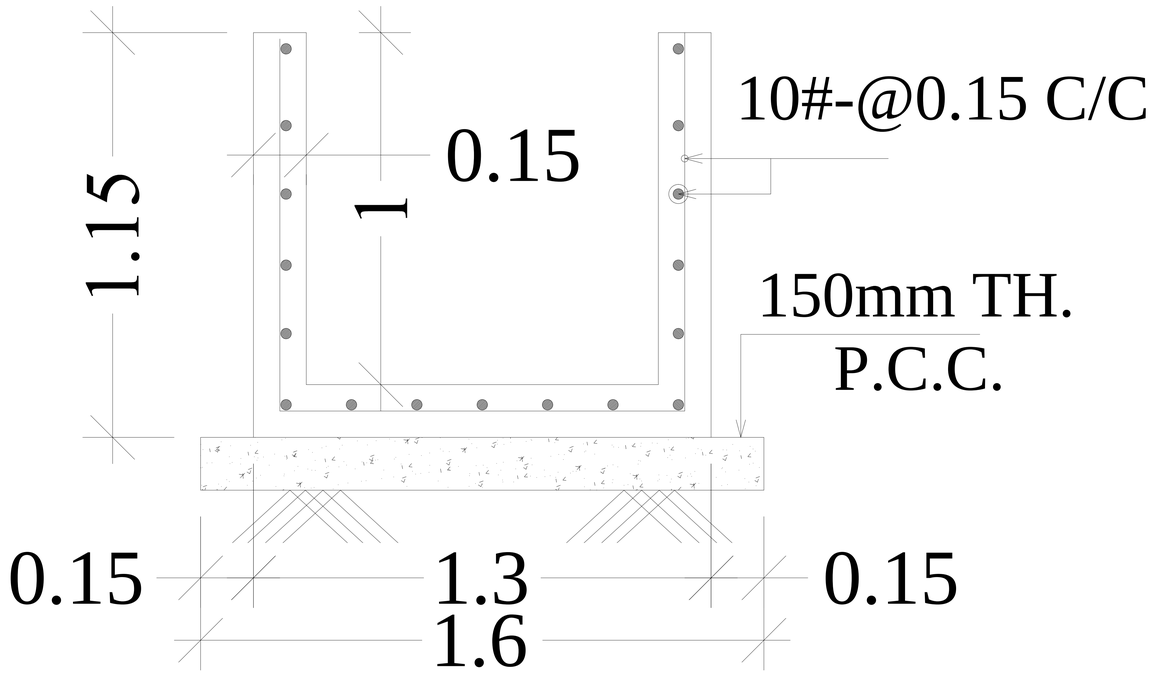
Downspouts shall be rectangular shapped, color coated and 0.5mm nominal thickness (26 gauge) galvanized steel. Downspouts shall have a 45 degree elbow at the bottom and shall be supported by attachment to the wall coveting at 3.0 m maximum spacing.
13. FIBERGLASS INSULATION :- The fiberglass insulation when offered as optional on mutual agreement shall be of 50 mm thickness of density 10kg/m3. with one side aluminum facing, other thickness and density are available and will be provided on prior negotiation.
14. ANCHOR BOLTS :- Thise are normally supplied prior to the delivery of pre- Engineered building.
4. BASIC BUILDING DESCRIPTION :-
A. Frame type - RF
B. Width (m) - 27.7 X 00m o/o
C. Length (M) - 18.5 m o/o
D. Eava height (M) -6.00 M clear
E. Roof slope - 1:10
F Bay spacing (m) - 7@7.857M
G. wind bracing - Pipe Bracing
H. Roof cladding (KR) - 26 GA bare Galvalume high tensil profile
I. Wall cladding (KW) - 26 GA colour Galvalume high tensil profile
J. Opening at front sidewall - 3.0 M heigth brick wall and above sheeting
K. Opening at back sidewall -3.0 M height brick wall and above sheeting

L. Opening at left end wall - 3.0 M height brick wall and above sheeting
M. Opening at right end wall - 3.0 M height brick wall and above sheeting
N. Eave gutters - Included
O. Downspouts - included
BUILDING ADDITIONS
A. conapy location/description - 3.1M X 18.5 M - 01NO.
STANDARD BUILDING ACCESSORIES
A. Sky lights - 1.0m X 3.305m -14 Nos. on the - Roof
B. Ridge Vents - 0.300m X 3.0m - 05 Nos. on the - Roof

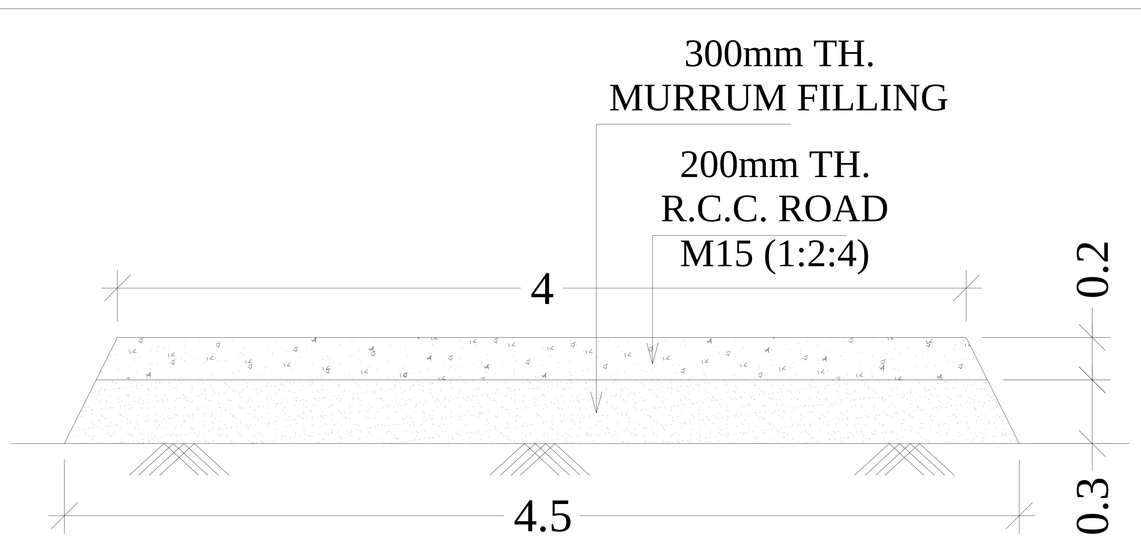
D. List of Drawing

S.No.	Drawing Title	Drawing Document
1	Jack fruit processing plan layout(ARC/ 01)	Attached
2	Rigid frame elevation at FL (ARC/02)	Attached
3	Typical section details Endwall framing and shitting elevation (ARC/03)	Attached
4	Side evelation and front elevation (ARC/04)	Attached
5	General Arrengement plan (STR./01)	Attached
6	Column centerline plan (STR/02)	Attached
7	Footing centerline plan (STR/03)	Attached
8	Graund beam plan (STR/04)	Attached
9	Plinth beam plan (STR/05)	Attached
10	Lintel beam plan (STR/06)	Attached

11	Column, footing, ground, plinth & lintel beam details (STR/07)	Attached
12	**Administrative block, plan, section & elevation (ARC/01)**	Attached
13	**Administrative block,** Column, footing, ground &slab beam plan (STR/01)	Attached
14	**Administrative block,** Column, footing & ground beam details (STR/02)	Attached
15	**Administrative block,** Terrace floor slab beam details (STR/03)	Attached
16	**Typical details of drain, road, boundary wall, (STR/01)**	Attached

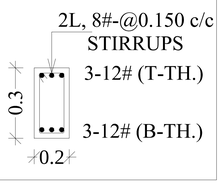


TYPICAL
DRAIN SECTION

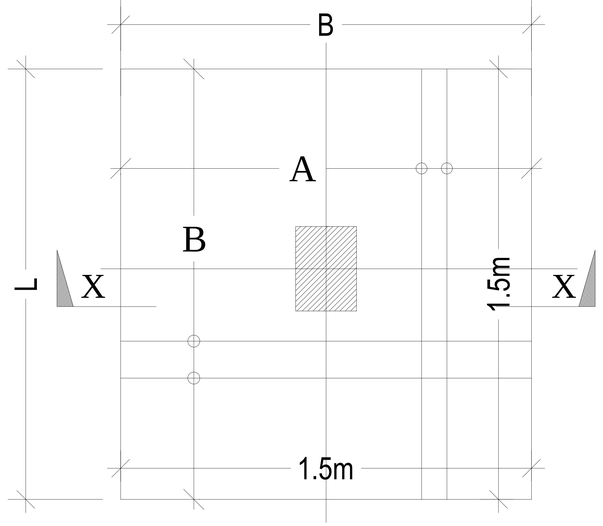


TYPICAL ROAD SECTION

GROUND BEAM -
GB1 :(0.2 X 0.3)



SECTION X-X



TYP. BOUNDARY WALL
COLUMN FOOTING PLAN

NOTE:-

1. ALL DIMENSION ARE IN METERS, UNLESS STATED OTHERWISE.
2. THIS DRAWING MUST NOT BE SCALED; ONLY WRITTEN DIMENSIONS TO BE FOLLOWED.
3. ANY DISCREPANCY OBSERVED SHOULD BE IMMEDIATELY BROUGHT TO THE CONSULTANTS NOTICE.
4. CORRECT POSITIONING OF ALL REINFORCEMENT BARS SHALL BE STRICTLY ENSURED BEFORE POURING CONCRETE.
5. STRICT QUALITY CONTROL SHALL BE ENSURED FOR ALL MATERIAL AND CONSTRUCTION ACTIVITIES.
6. PROPER CURING OF CONCRETE , AS PER I.S: 456 - 2000, SHALL BE STRICTLY MAINTAINED.
7. USE:-
   a) HIGH YIELD STRENGTH DEFORMED STEEL BARS CONFORMING TO I.S. 1786 - 2008 WITH YIELD STRENGTH NOT LESS THAN 500 N/mm2. UNLESS SPECIFIED OTHERWISE.
   b) REINFORCED CEMENT CONCRETE - M-25 GRADE FOR ALL R.C.C WORK.
8. NO DEVIATIONS FROM THIS DRAWING SHOULD BE MADE WITHOUT A WRITTEN CONSENT FROM THE CONSULTANT.
9. CLEAR COVER : COLUMN -40 mm, FOOTING -50mm, BEAMS -25 mm & SLAB -20 mm.
10. WALL THICKNESS = 0.1m/0.2m.
11. SHUTTERING & SCAFFOLDING AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
12. STRIPPING TIME TABLE AS PER IS: 456-2000.

Type of Formwork	Minimum period before striking formwork
Vertical formwork to columns,walls and beams.	16 to 24 hours
Props to be Refixed immediately after removal of formwork.	
i) soffit formwork to Slabs	7 days
ii) soffit formwork to Beams	10 days
Props to Slabs:	
i) Slabs spanning up to 4.5m	10 days
ii) Slabs spanning over 4.5m	14 days
Props to beams and arches:	
i) Span up to 6m	14 days
ii) Span over 6m	21 days

13. ALL SAFETY MEASURES AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
14. ALL LAPS (Ld) SHALL BE STAGGERED & NOT MORE THAN 50% BARS TO BE LAPPED AT ANY GIVEN SECTION.

GRADE OF REINF.	M20	M25	M30
Fe500 (TMT)	57 X D	49 X D	46 X D

FOR BUNDLED BARS, LD SHALL BE INCREASED BY 10% FOR 2 BARS IN CONTACT, 20% FOR 3 BARS IN CONTACT AND 33% FOR 4 BARS IN CONTACT.

15. THE WORK SHOULD BE CARRIED OUT UNDER STRICT SUPERVISION OF QUALIFIED CIVIL/STRUCTURAL ENGINEER.
16. SBC IS TAKEN 20.00 T/M2 AT 3.0m DEPTH FROM THE N.G.L. & WATER TABLE 2m BELOW THE N.G.L. LEVEL AS PER CLIENT.

DRG. No.:-	*STR/01*
REV. No.:-	*R1*
Date :-	*28 FEB 2023*

Project :-

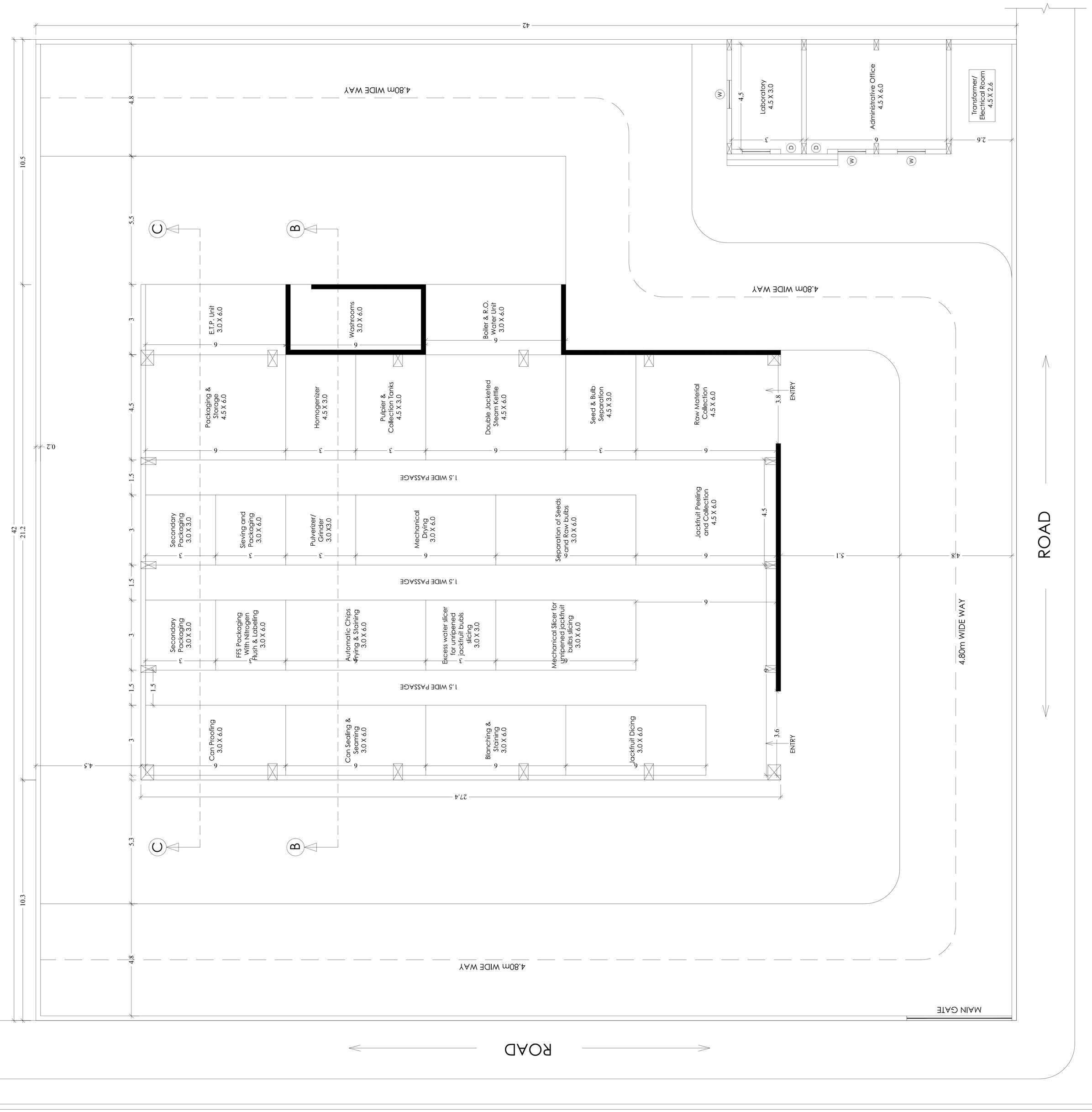
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

TYPICAL DETAILS



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DRG. No.:-	*ARC/01*
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JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

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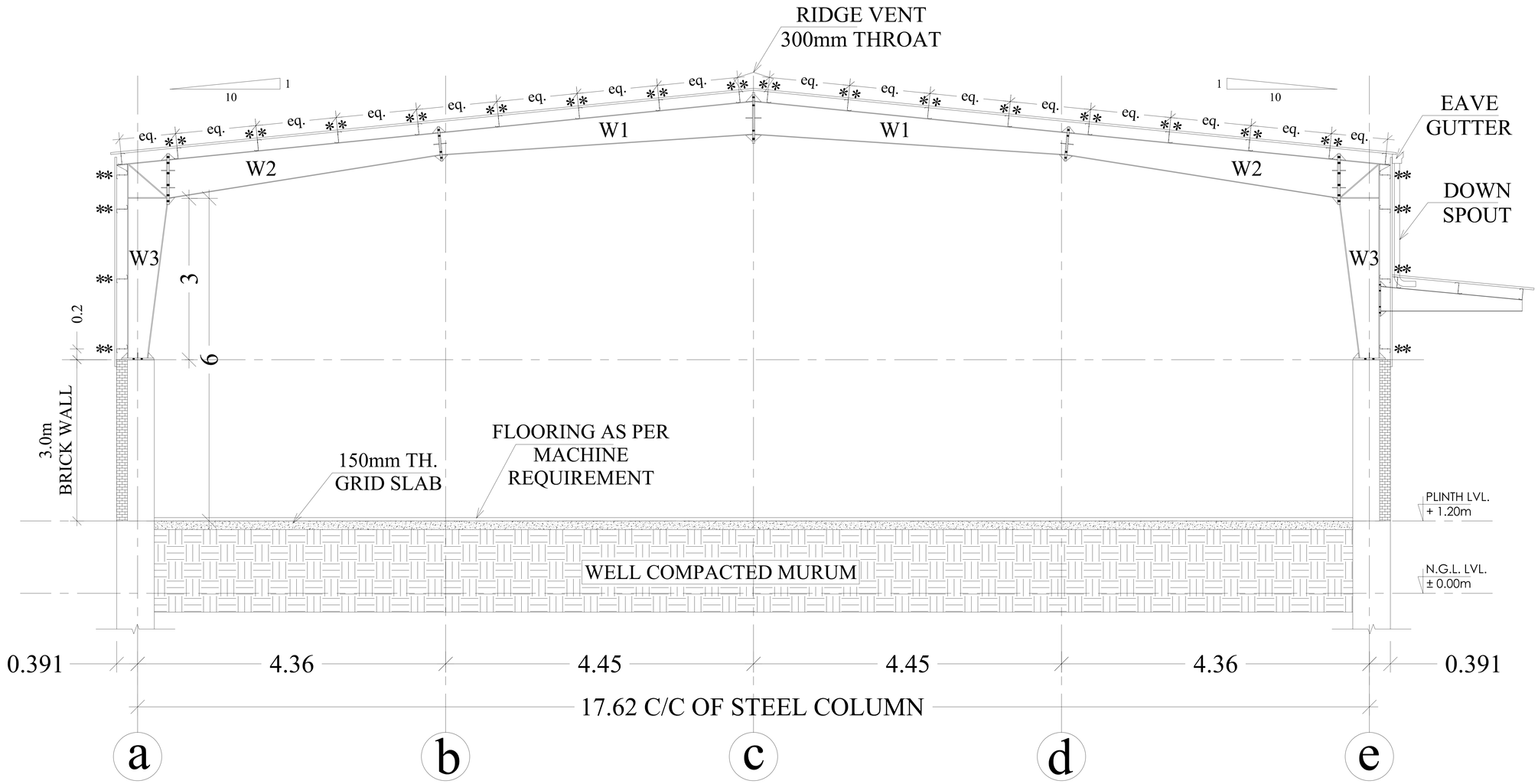
CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

GROUND FLOOR PLAN



RIGID FRAME ELEVATION AT FL :- 2 & 5

** DENOTES DOUBLE SIDED FLANGE BRACE

SECTION (B-B)

NOTE:-

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DRG. No.:-	*ARC/02*
REV. No.:-	*R1*
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Project :-

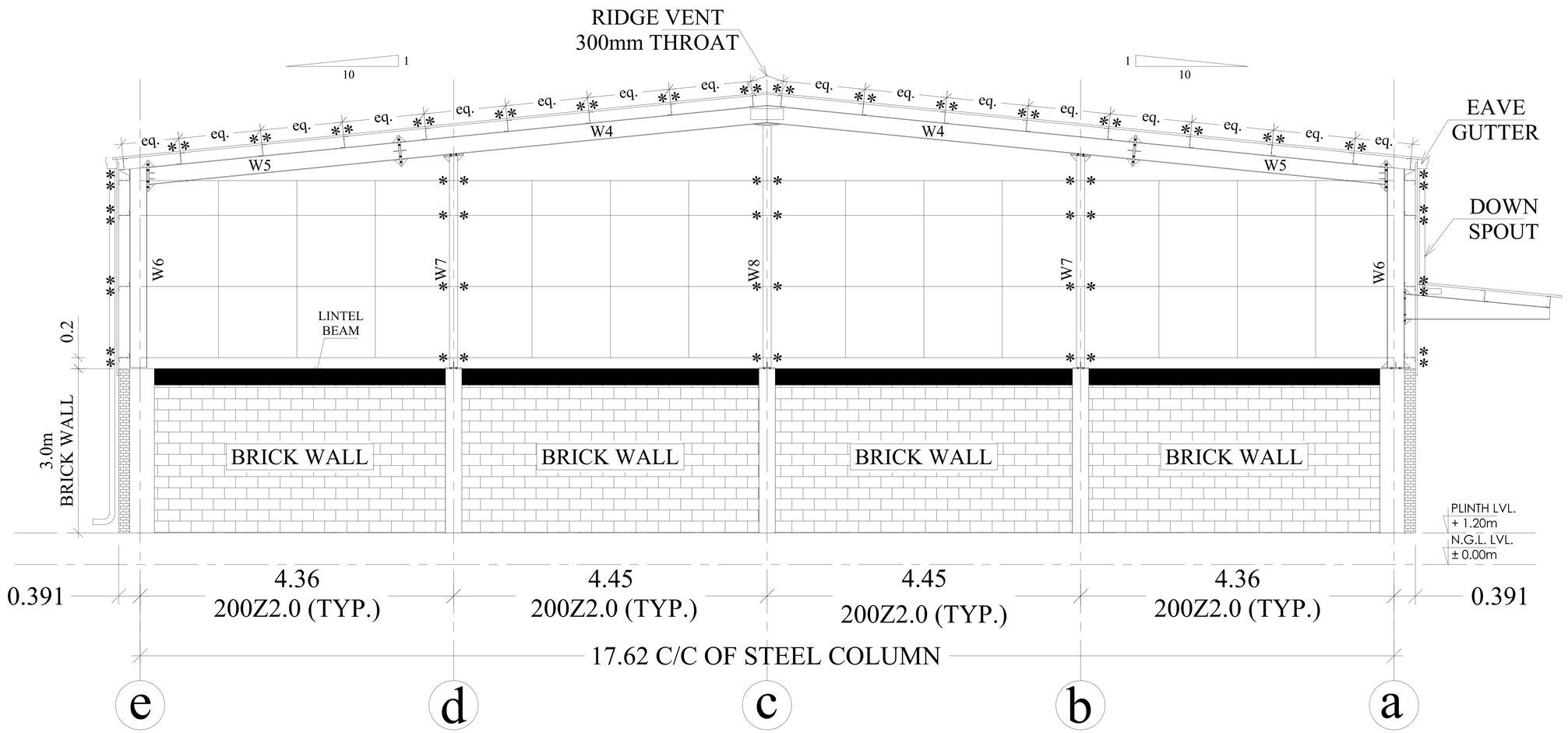
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

TYPICAL SECTION DETAILS-001



ENDWALL FRAMING & SHEETING ELEVATION AT FL :- 1 & 6

** DENOTES DOUBLE SIDED FLANGE BRACE.

* DENOTES SINGLE SIDED FLANGE BRACE.

SECTION (C-C)

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DRG. No.:-	*ARC/03*
REV. No.:-	*R1*
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Project :-

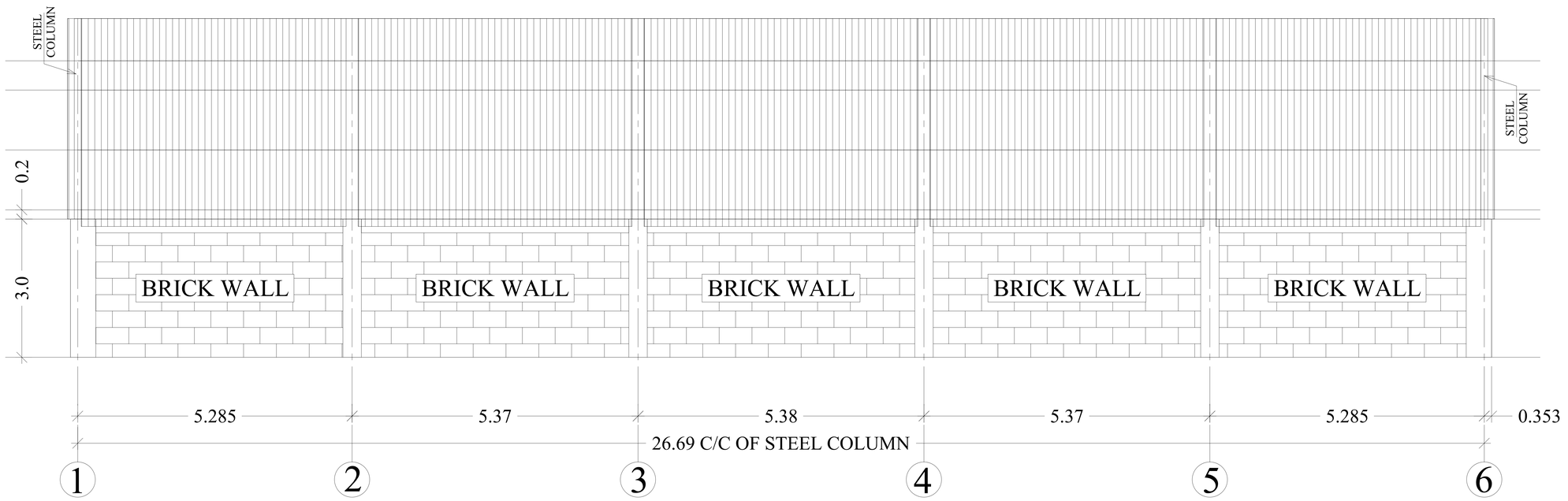
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

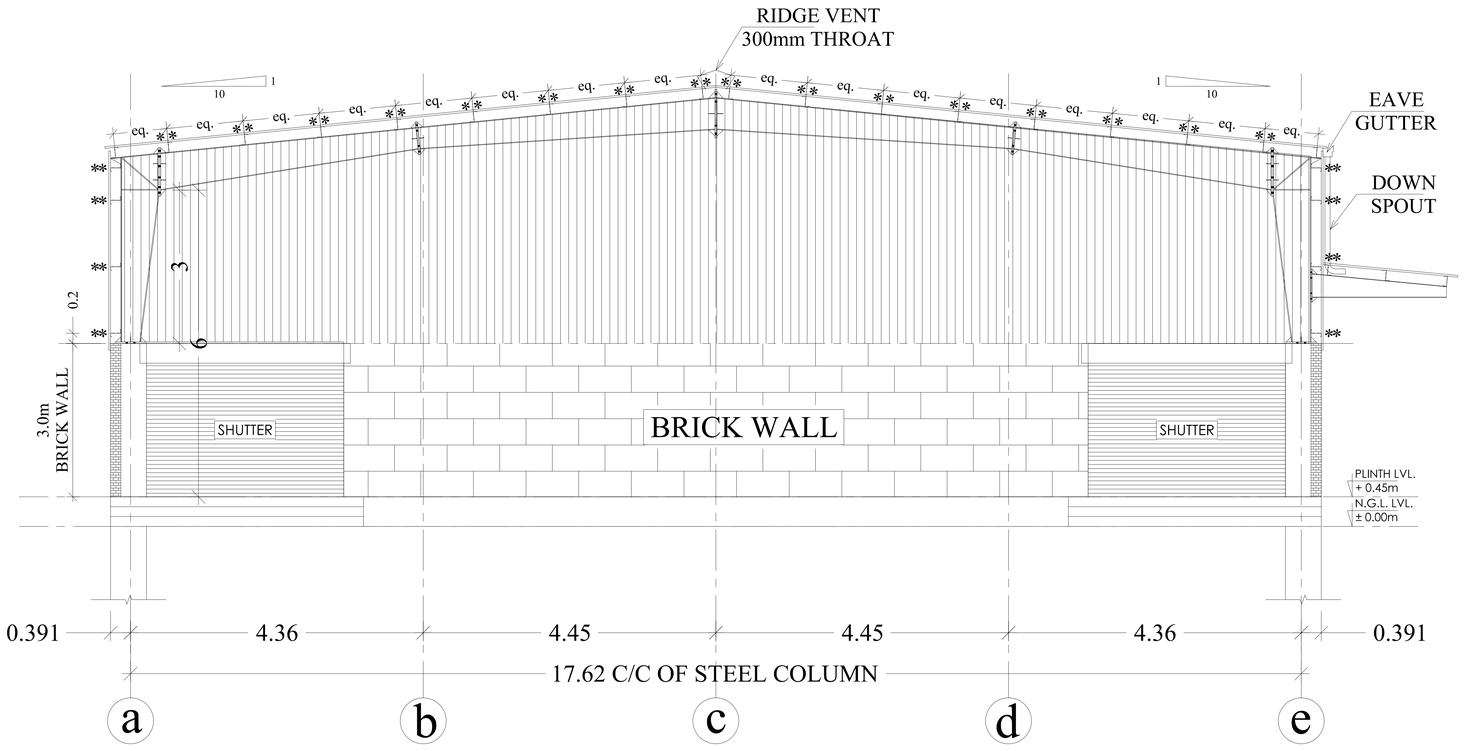
CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

TYPICAL SECTION DETAILS-002



SIDEWALL ELEVATION



FRONT ELEVATION

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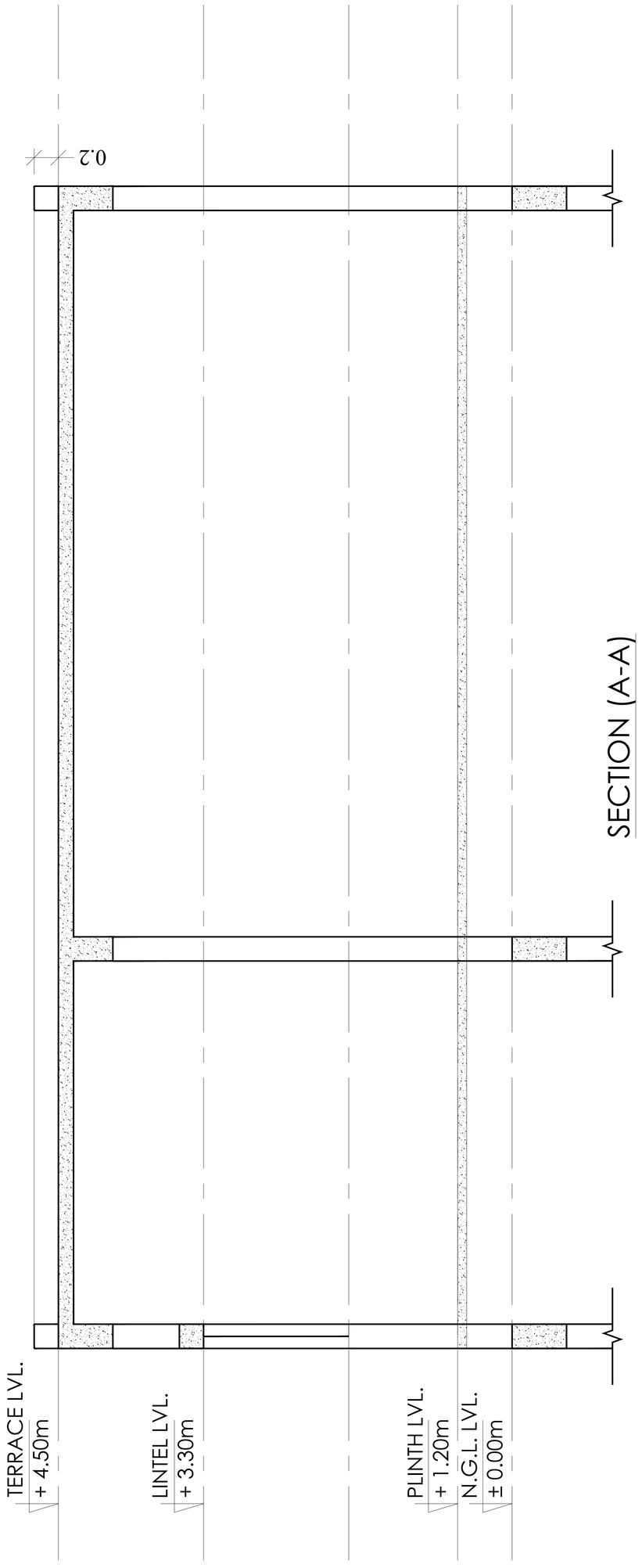
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

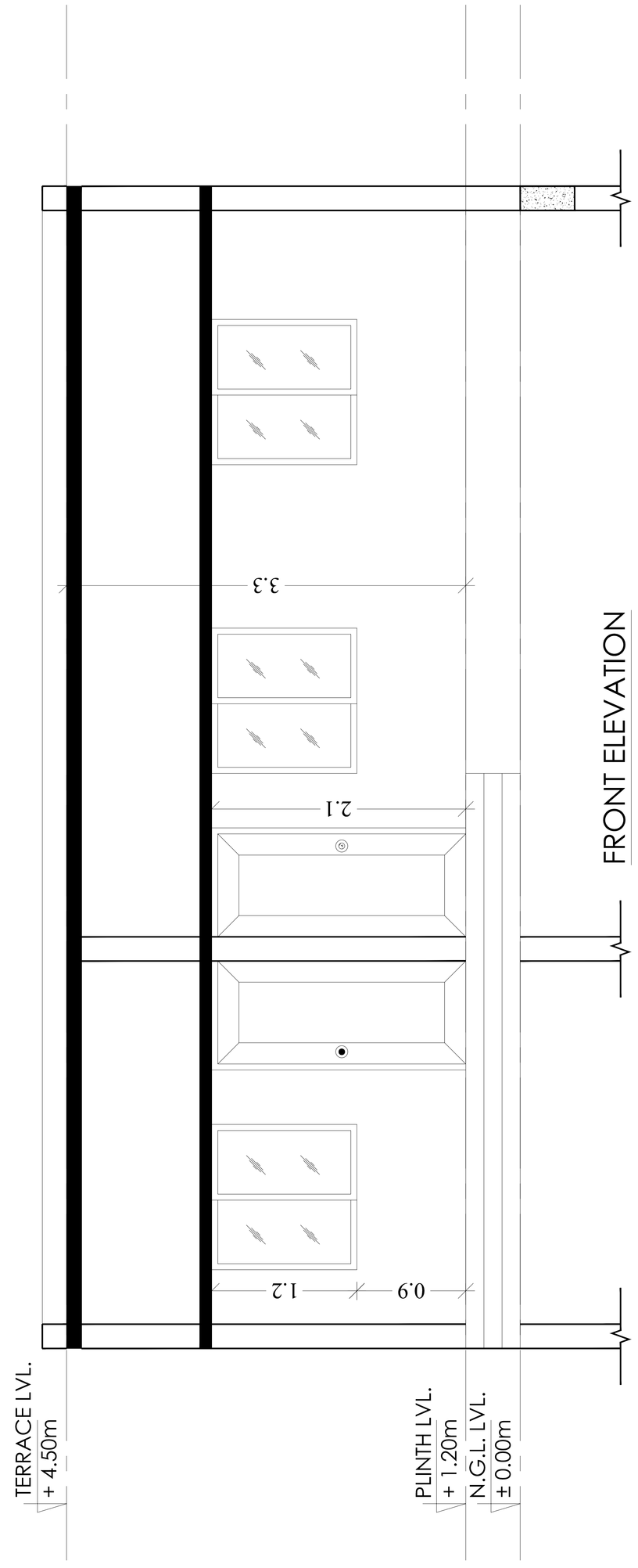
CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

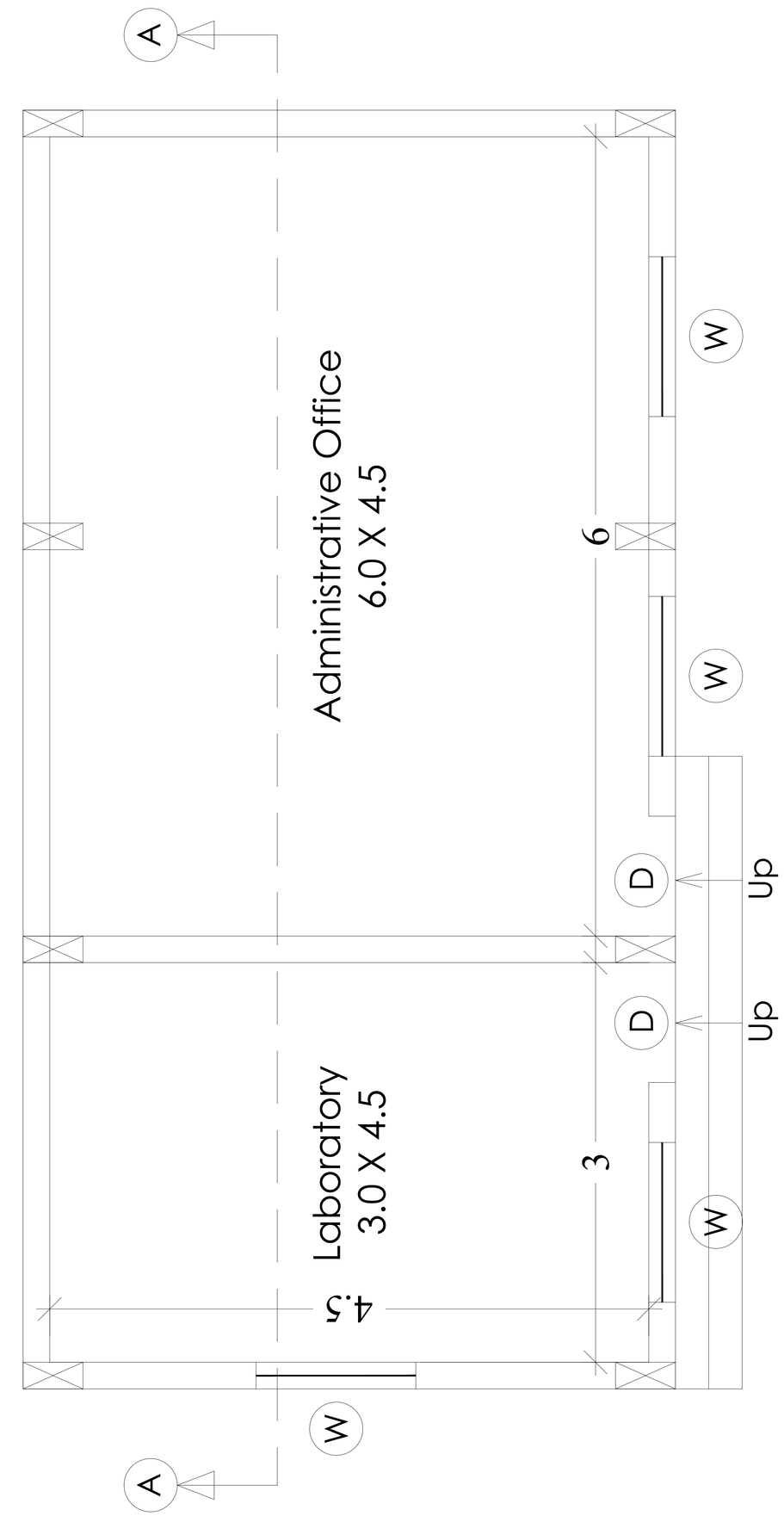
TYPICAL ELEVATION



SECTION (A-A)



FRONT ELEVATION



GROUND FLOOR PLAN

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DRG. No.:-	*ARC/01*
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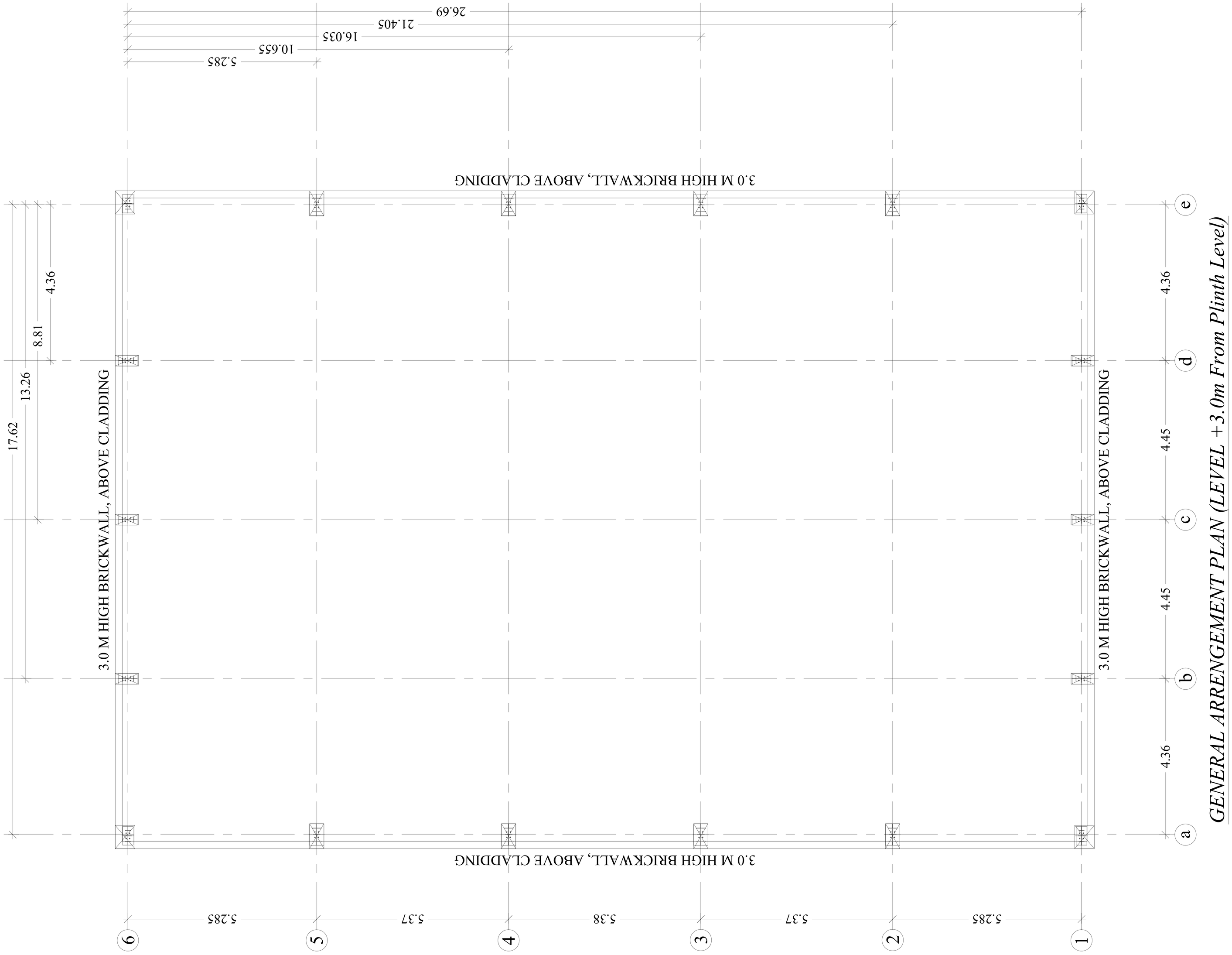
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

ADMINISTRATIVE BLOCK, PLAN , SECTION & ELEVATION



GENERAL ARRENGEMENT PLAN (LEVEL +3.0m From Plinth Level)

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12. STRIPPING TIME TABLE AS PER IS: 456-2000.

Type of Formwork	Minimum period before striking formwork
Vertical formwork to columns,walls and beams.	16 to 24 hours
Props to be Refixed immediately after removal of formwork.	
i) soffit formwork to Slabs	7 days
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Props to Slabs:	
i) Slabs spanning up to 4.5m	10 days
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DRG. No.:-	*STR/01*
REV. No.:-	*R1*
Date :-	*28 FEB 2023*

Project :-

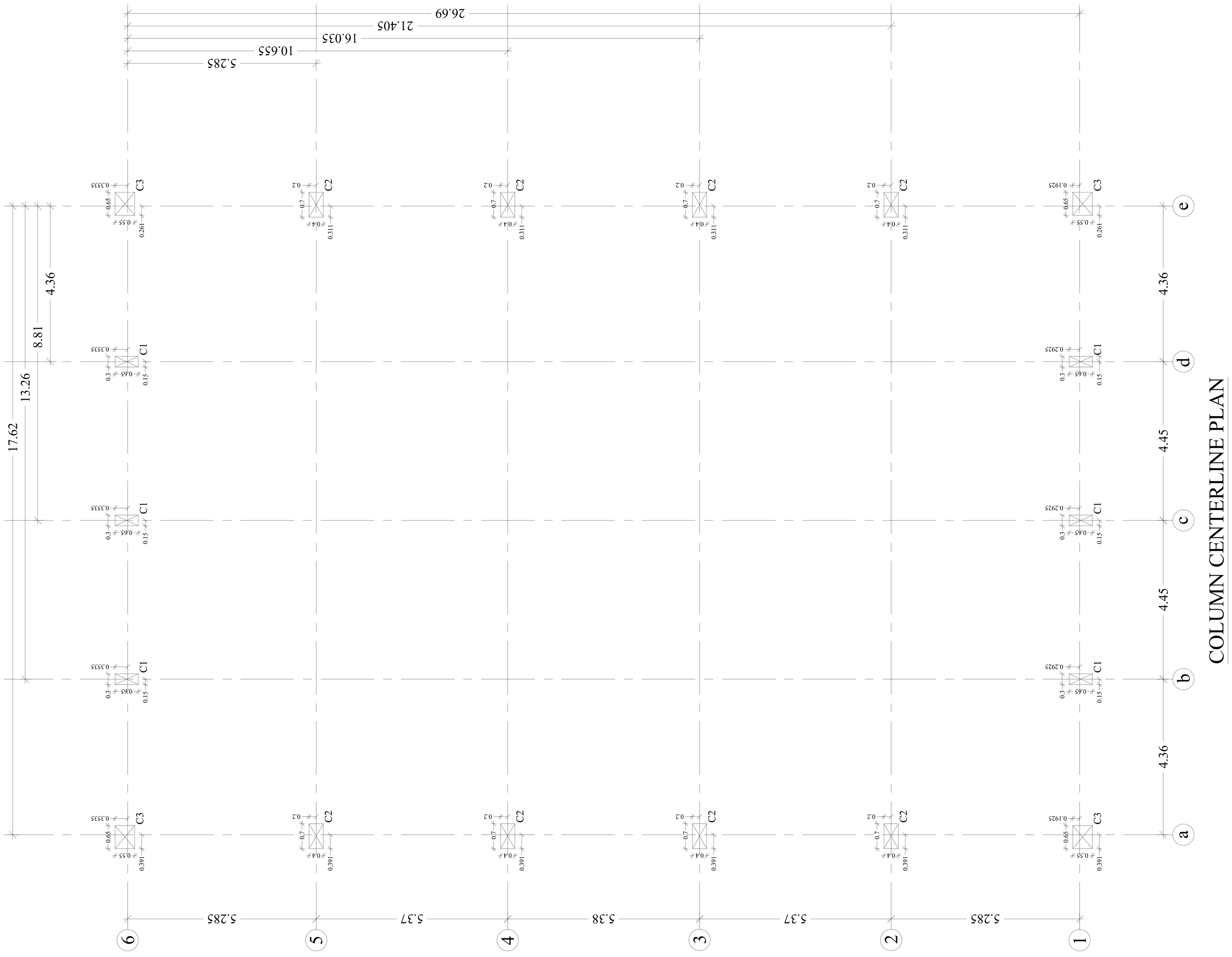
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

GENERAL ARRANGEMENT PLAN



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DRG. No.:-	*STR/02*
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Project :-

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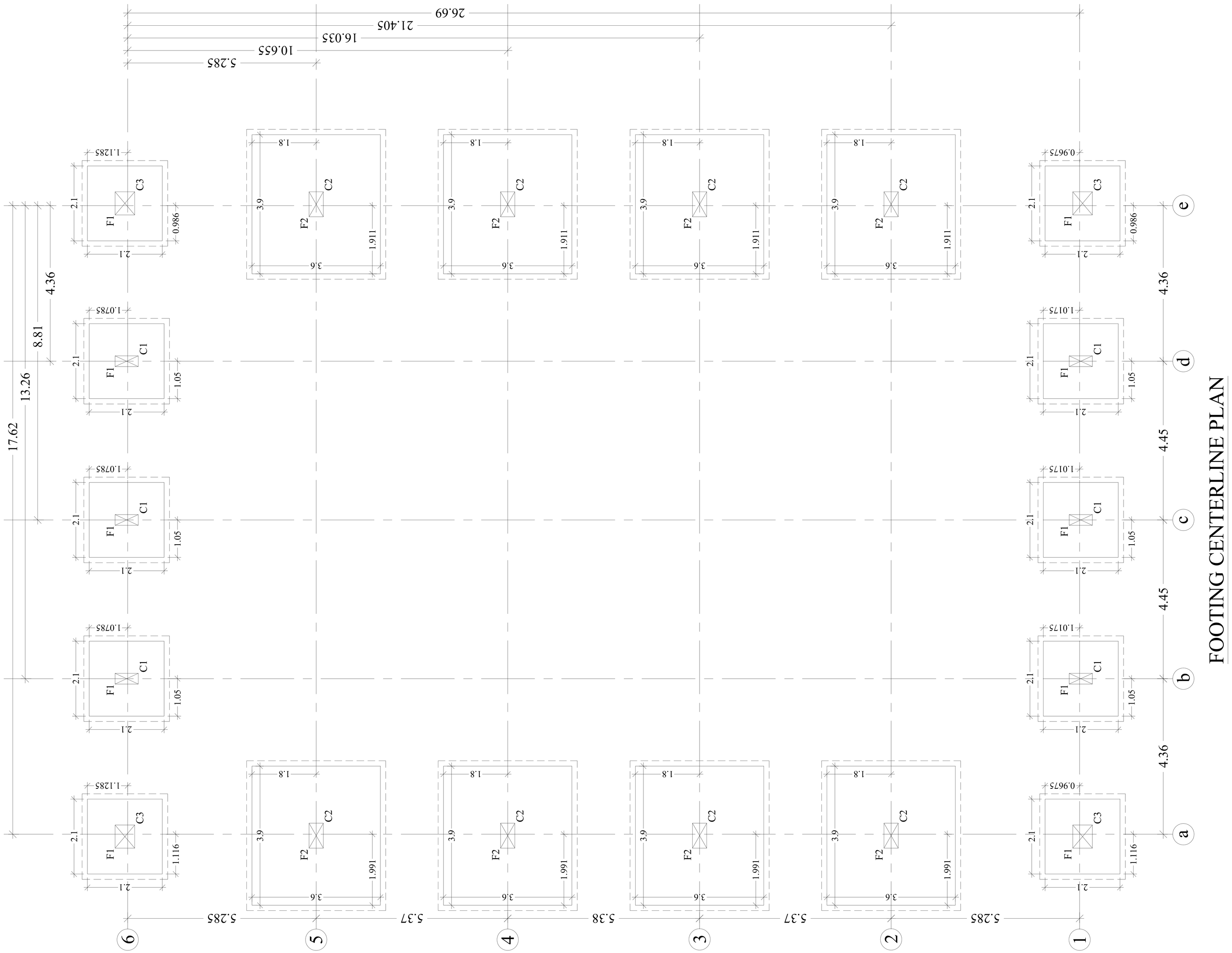
Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

COLUMN CENTERLINE PLAN



FOOTING CENTERLINE PLAN

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DRG. No.:-	*STR/03*
REV. No.:-	*R1*
Date :-	*28 FEB 2023*

Project :-

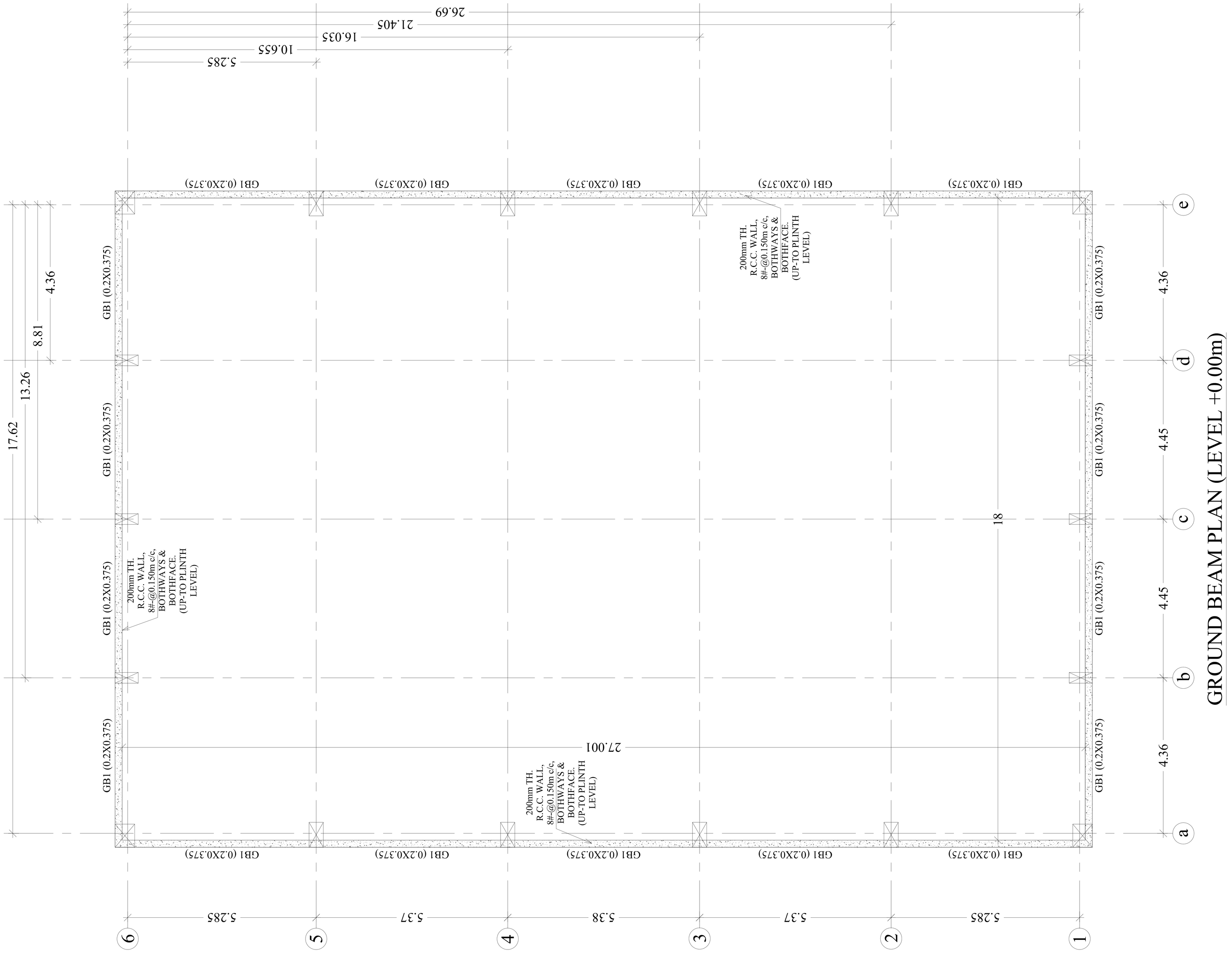
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

FOOTING CENTERLINE PLAN



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DRG. No.:-	*STR/04*
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Date :-	*28 FEB 2023*

Project :-

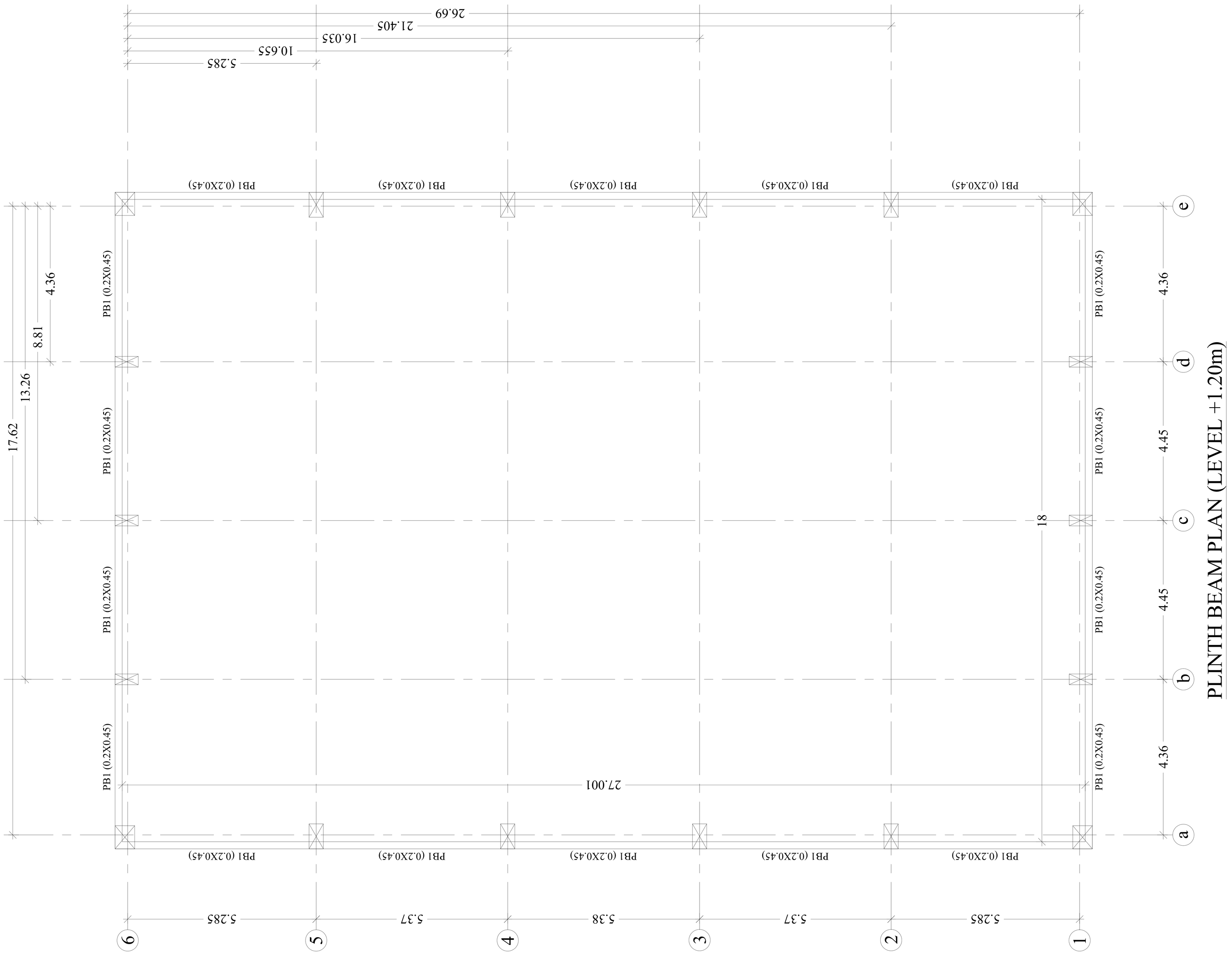
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

GROUND BEAM PLAN



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Props to Slabs:	
i) Slabs spanning up to 4.5m	10 days
ii) Slabs spanning over 4.5m	14 days
Props to beams and arches:	
i) Span up to 6m	14 days
ii) Span over 6m	21 days

13. ALL SAFETY MEASURES AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
14. ALL LAPS (Ld) SHALL BE STAGGERED & NOT MORE THAN 50% BARS TO BE LAPPED AT ANY GIVEN SECTION.

GRADE OF REINF.	M20	M25	M30
Fe500 (TMT)	57 X D	49 X D	46 X D

FOR BUNDLED BARS, LD SHALL BE INCREASED BY 10% FOR 2 BARS IN CONTACT, 20% FOR 3 BARS IN CONTACT AND 33% FOR 4 BARS IN CONTACT.

15. THE WORK SHOULD BE CARRIED OUT UNDER STRICT SUPERVISION OF QUALIFIED CIVIL/STRUCTURAL ENGINEER.
16. SBC IS TAKEN 20.00 T/M2 AT 3.0m DEPTH FROM THE N.G.L. & WATER TABLE 2m BELOW THE N.G.L. LEVEL AS PER CLIENT.

DRG. No.:-	*STR/05*
REV. No.:-	*R1*
Date :-	*28 FEB 2023*

Project :-

JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

PLINTH BEAM PLAN

LINTEL BEAM PLAN (LEVEL +4.20m)

NOTE:-

1. ALL DIMENSION ARE IN METERS, UNLESS STATED OTHERWISE.
2. THIS DRAWING MUST NOT BE SCALED; ONLY WRITTEN DIMENSIONS TO BE FOLLOWED.
3. ANY DISCREPANCY OBSERVED SHOULD BE IMMEDIATELY BROUGHT TO THE CONSULTANTS NOTICE.
4. CORRECT POSITIONING OF ALL REINFORCEMENT BARS SHALL BE STRICTLY ENSURED BEFORE POURING CONCRETE.
5. STRICT QUALITY CONTROL SHALL BE ENSURED FOR ALL MATERIAL AND CONSTRUCTION ACTIVITIES.
6. PROPER CURING OF CONCRETE , AS PER I.S: 456 - 2000, SHALL BE STRICTLY MAINTAINED.
7. USE:-
   a) HIGH YIELD STRENGTH DEFORMED STEEL BARS CONFORMING TO I.S. 1786 - 2008 WITH YIELD STRENGTH NOT LESS THAN 500 N/mm2. UNLESS SPECIFIED OTHERWISE.
   b) REINFORCED CEMENT CONCRETE - M-25 GRADE FOR ALL R.C.C WORK.
8. NO DEVIATIONS FROM THIS DRAWING SHOULD BE MADE WITHOUT A WRITTEN CONSENT FROM THE CONSULTANT.
9. CLEAR COVER : COLUMN -40 mm, FOOTING -50mm, BEAMS -25 mm & SLAB -20 mm.
10. WALL THICKNESS = 0.1m/0.2m.
11. SHUTTERING & SCAFFOLDING AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
12. STRIPPING TIME TABLE AS PER IS: 456-2000.

Type of Formwork	Minimum period before striking formwork
Vertical formwork to columns,walls and beams.	16 to 24 hours
Props to be Refixed immediately after removal of formwork.	
i) soffit formwork to Slabs	7 days
ii) soffit formwork to Beams	10 days
Props to Slabs:	
i) Slabs spanning up to 4.5m	10 days
ii) Slabs spanning over 4.5m	14 days
Props to beams and arches:	
i) Span up to 6m	14 days
ii) Span over 6m	21 days

13. ALL SAFETY MEASURES AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
14. ALL LAPS (Ld) SHALL BE STAGGERED & NOT MORE THAN 50% BARS TO BE LAPPED AT ANY GIVEN SECTION.

GRADE OF REINF.	M20	M25	M30
Fe500 (TMT)	57 X D	49 X D	46 X D

FOR BUNDLED BARS, LD SHALL BE INCREASED BY 10% FOR 2 BARS IN CONTACT, 20% FOR 3 BARS IN CONTACT AND 33% FOR 4 BARS IN CONTACT.

15. THE WORK SHOULD BE CARRIED OUT UNDER STRICT SUPERVISION OF QUALIFIED CIVIL/STRUCTURAL ENGINEER.
16. SBC IS TAKEN 20.00 T/M2 AT 3.0m DEPTH FROM THE N.G.L. & WATER TABLE 2m BELOW THE N.G.L. LEVEL AS PER CLIENT.

DRG. No.:- *STR/06*

REV. No.:- *R1*

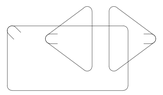
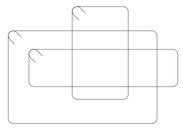
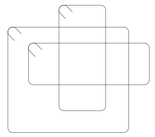
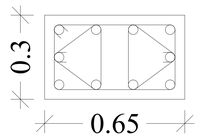
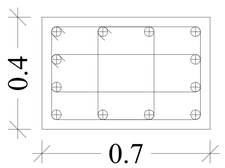
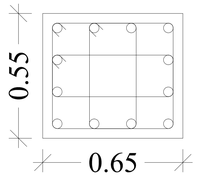
Date :- *28 FEB 2023*

Project :- *JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)*

Client :- *CGMFPFED NAYA RAIPUR , (C.G.)*

Title :- *LINTEL BEAM PLAN*

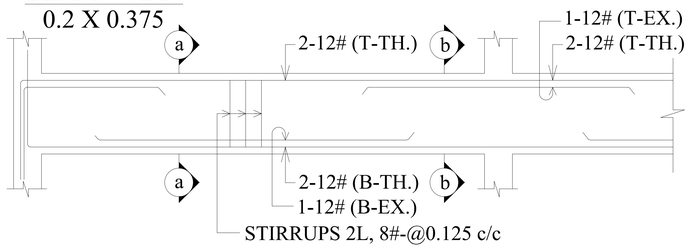
COLUMN SCHEDULE (M25:Fe500D)

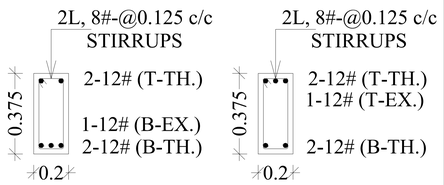
UP-TO TOP	M25 : Fe500D	M25 : Fe500D	M25 : Fe500D
			
	LINKS	LINKS	LINKS
	T8-@0.150m c/c	T8-@0.150m c/c	T8-@0.150m c/c
			
	○T16	⊕T20	○T16
	10-T16	12-T20	12-T16
SIZE	0.300X0.650	0.400X0.700	0.550X0.650
COLUMN MARKED	C1	C2	C3

FOOTING SCHEDULE (M25:Fe500D)

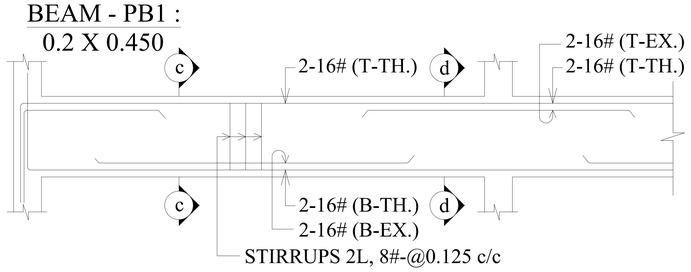
FOOTING NUMBERS	FOOTING TYPE	FOOTING SIZE		D	BOTTOM REINFORCEMENT	
		L	B		MAIN	DIST.
F1	BOX	2.100	2.100	0.450	T10-@0.125c/c	T10-@0.125c/c
F2	BOX	3.900	3.600	0.525	T10-@0.100c/c	T10-@0.100c/c

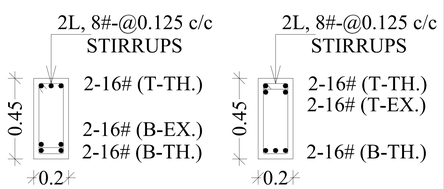
BEAM - GB1 :
0.2 X 0.375

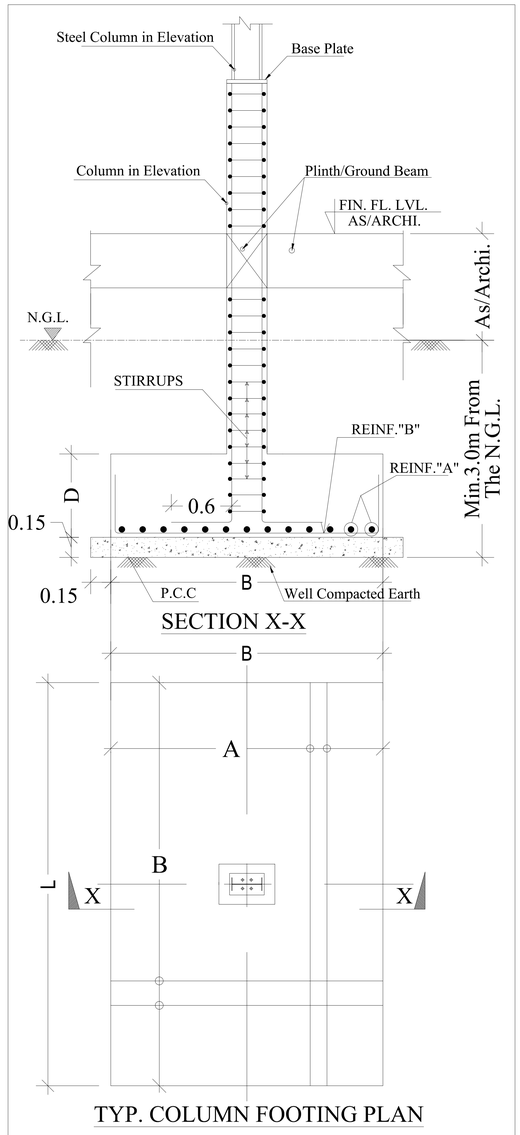




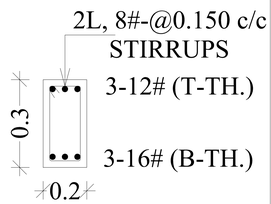
BEAM - PB1 :
0.2 X 0.450







BEAM - LB1 :
0.2 X 0.3



NOTE:-

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   a) HIGH YIELD STRENGTH DEFORMED STEEL BARS CONFORMING TO I.S. 1786 - 2008 WITH YIELD STRENGTH NOT LESS THAN 500 N/mm2. UNLESS SPECIFIED OTHERWISE.
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11. SHUTTERING & SCAFFOLDING AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
12. STRIPPING TIME TABLE AS PER IS: 456-2000.

Type of Formwork	Minimum period before striking formwork
Vertical formwork to columns,walls and beams.	16 to 24 hours
Props to be Refixed immediately after removal of formwork.	
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GRADE OF REINF.	M20	M25	M30
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DRG. No.:-	*STR/07*
REV. No.:-	*R1*
Date :-	*28 FEB 2023*

Project :-

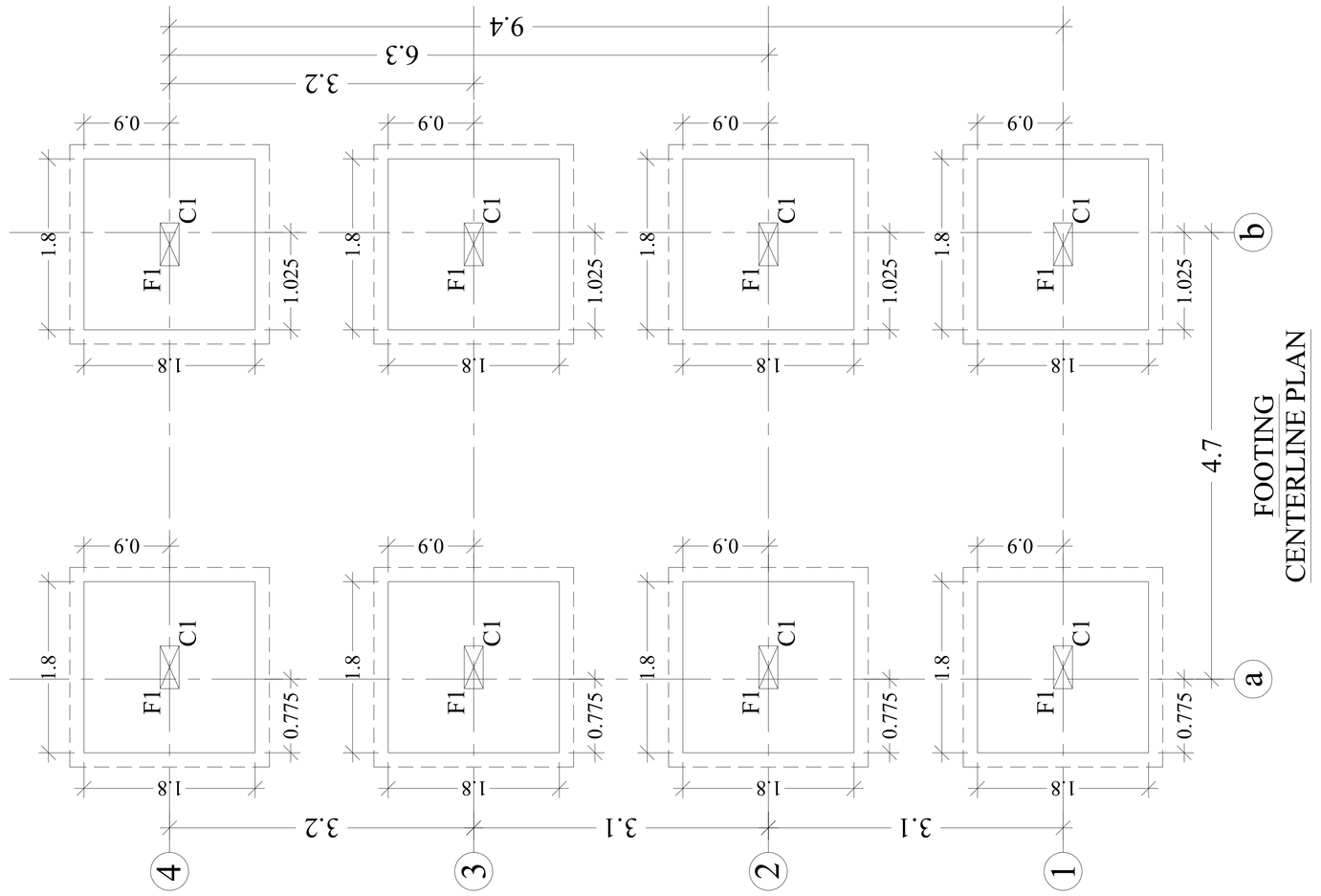
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

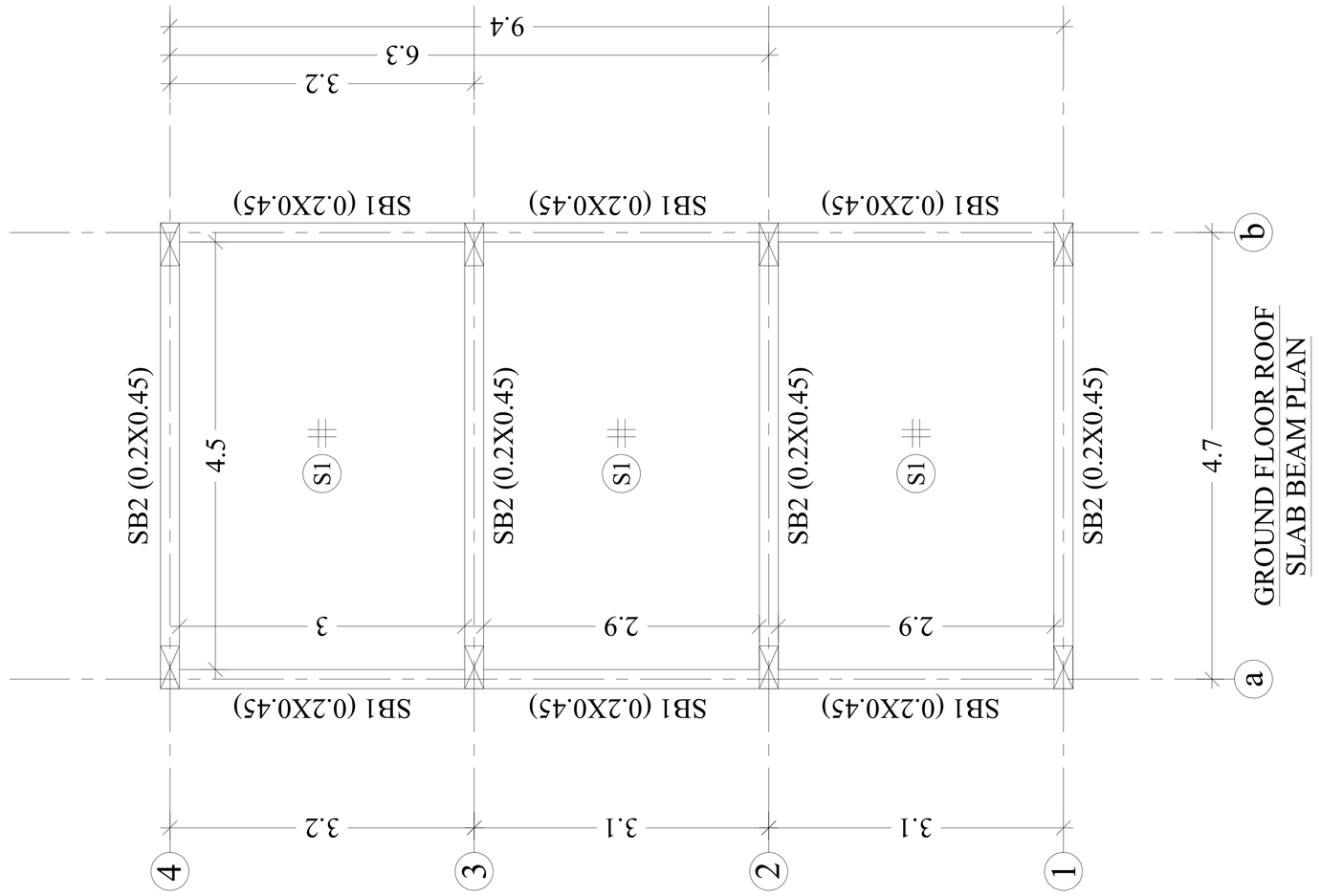
Client :-

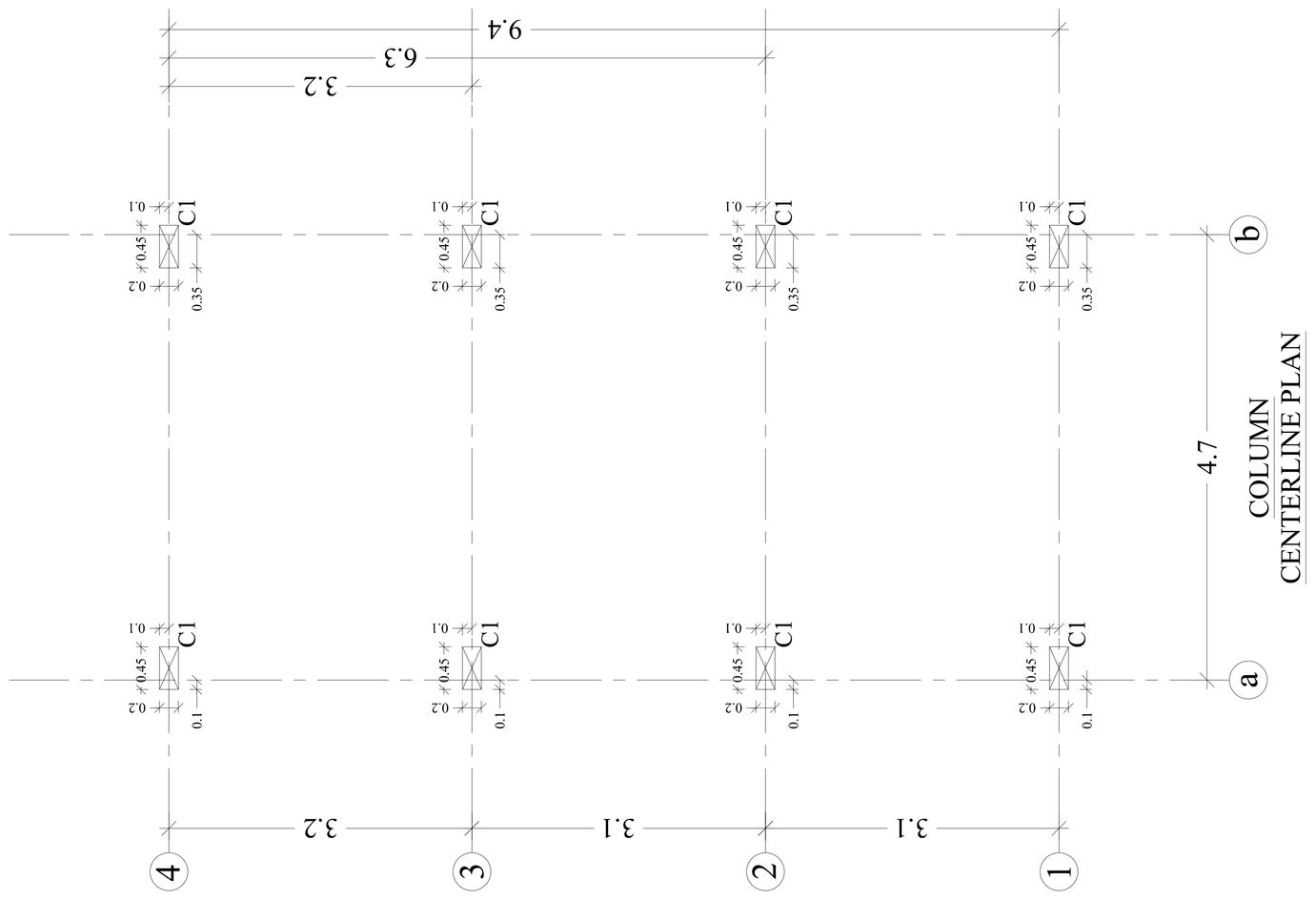
CGMFPFED NAYA RAIPUR , (C.G.)

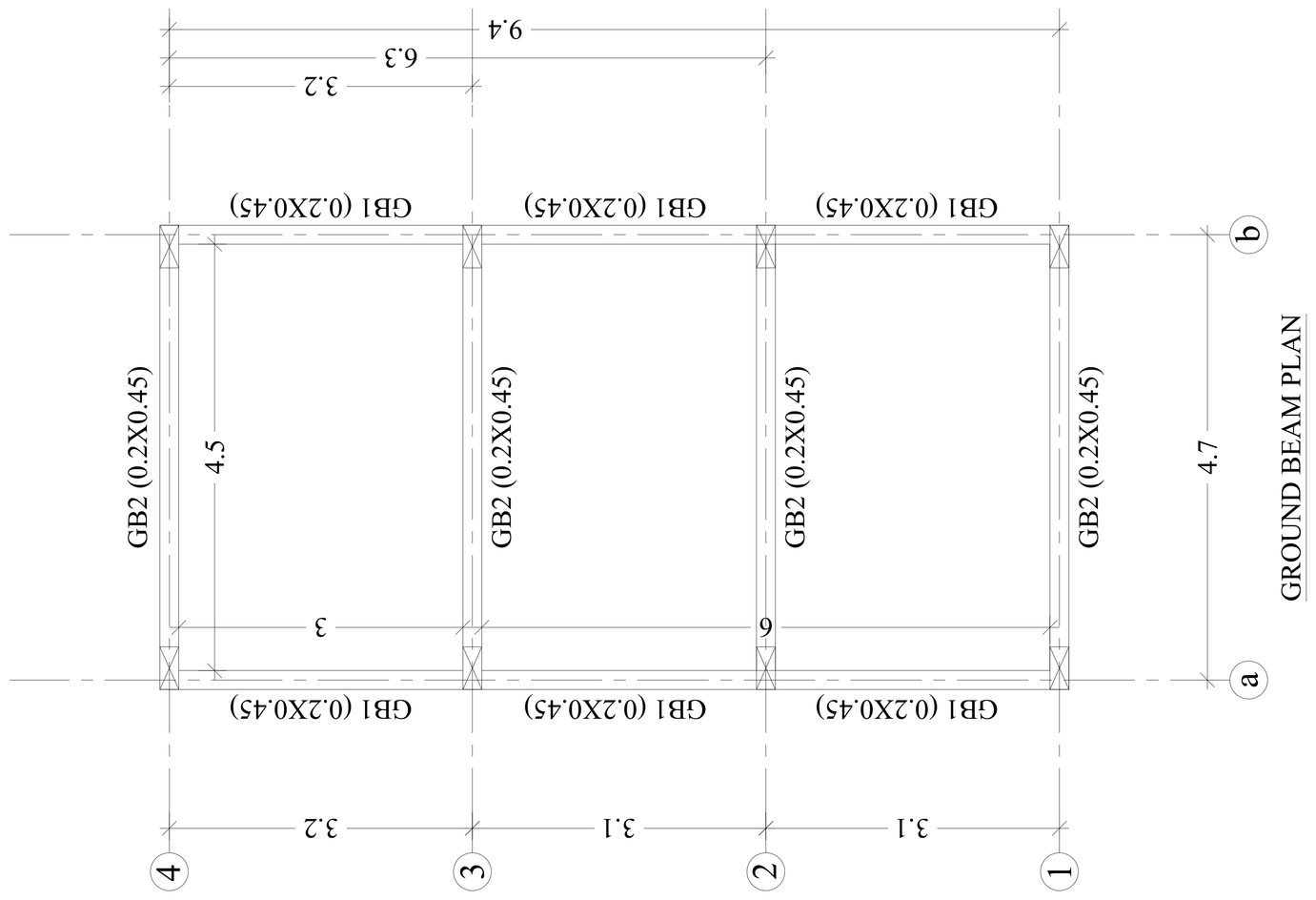
Title :-

COLUMN, FOOTING, GROUND, PLINTH & LINTEL BEAM DETAILS









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7. USE:-
   a) HIGH YIELD STRENGTH DEFORMED STEEL BARS CONFORMING TO I.S. 1786 - 2008 WITH YIELD STRENGTH NOT LESS THAN 500 N/mm2. UNLESS SPECIFIED OTHERWISE.
   b) REINFORCED CEMENT CONCRETE - M-25 GRADE FOR ALL R.C.C WORK.
8. NO DEVIATIONS FROM THIS DRAWING SHOULD BE MADE WITHOUT A WRITTEN CONSENT FROM THE CONSULTANT.
9. CLEAR COVER : COLUMN -40 mm, FOOTING -50mm, BEAMS -25 mm & SLAB -20 mm.
10. WALL THICKNESS = 0.1m/0.2m.
11. SHUTTERING & SCAFFOLDING AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
12. STRIPPING TIME TABLE AS PER IS: 456-2000.

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Vertical formwork to columns,walls and beams.	16 to 24 hours
Props to be Refixed immediately after removal of formwork.	
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GRADE OF REINF.	M20	M25	M30
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16. SBC IS TAKEN 20.00 T/M2 AT 3.0m DEPTH FROM THE N.G.L. & WATER TABLE 2m BELOW THE N.G.L. LEVEL AS PER CLIENT.

DRG. No.:-	*STR/01*
REV. No.:-	*R1*
Date :-	*28 FEB 2023*

Project :-

JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

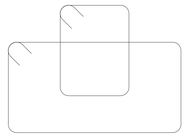
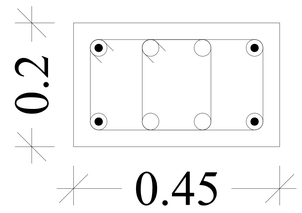
Client :-

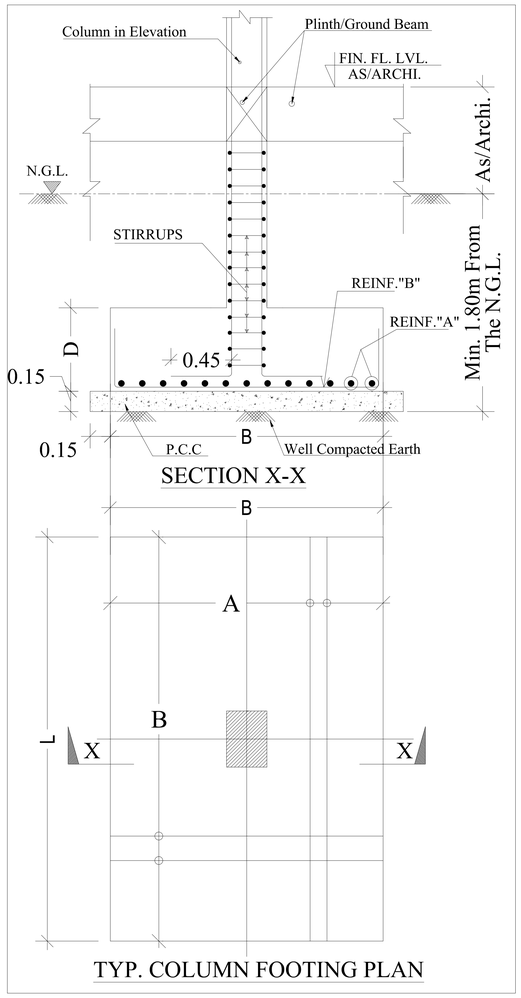
CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

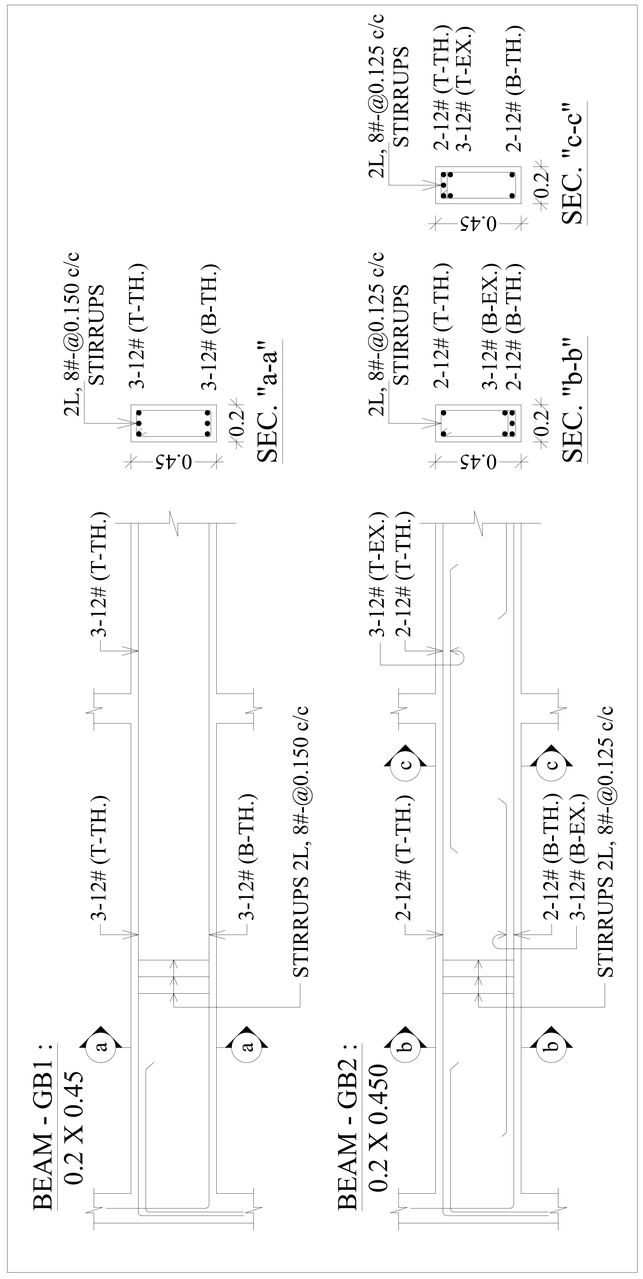
COLUMN, FOOTING, GROUND, & SLAB BEAM PLAN

COLUMN SCHEDULE (M25:Fe500D)

UP-TO TOP	M25 : Fe500D	
	LINKS	
	T8-@0.150m c/c	
	⊙T16	
	8-T16	
SIZE	0.200X0.450	
COLUMN MARKED	C1	



TYP. COLUMN FOOTING PLAN



FOOTING SCHEDULE (M25:Fe500D)

FOOTING NUMBERS	FOOTING TYPE	FOOTING SIZE		D	BOTTOM REINFORCEMENT	
		L	B		MAIN	DIST.
F1	BOX	1.800	1.800	0.450	T10-@0.125c/c	T10-@0.125c/c

NOTE:-

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12. STRIPPING TIME TABLE AS PER IS: 456-2000.

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Vertical formwork to columns,walls and beams.	16 to 24 hours
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GRADE OF REINF.	M20	M25	M30
Fe500 (TMT)	57 X D	49 X D	46 X D

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16. SBC IS TAKEN 20.00 T/M2 AT 3.0m DEPTH FROM THE N.G.L. & WATER TABLE 2m BELOW THE N.G.L. LEVEL AS PER CLIENT.

DRG. No.:-	*STR/02*
REV. No.:-	*R1*
Date :-	*02 MAR 2023*

Project :-

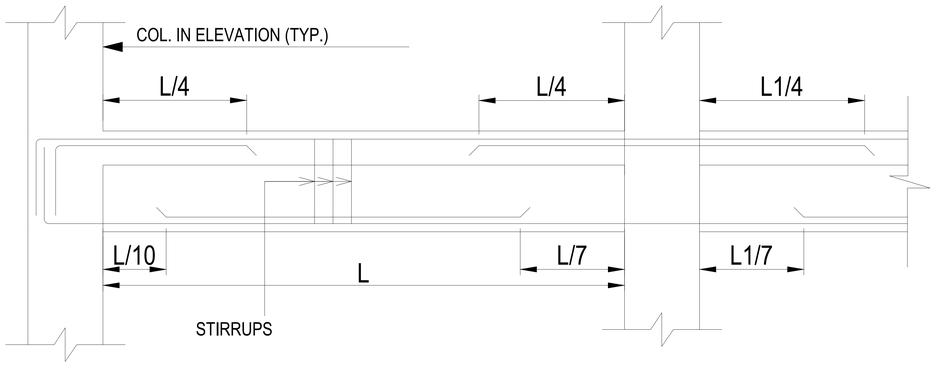
JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

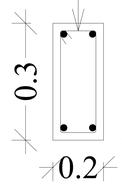
COLUMN, FOOTING, & GROUND BEAM DETAILS



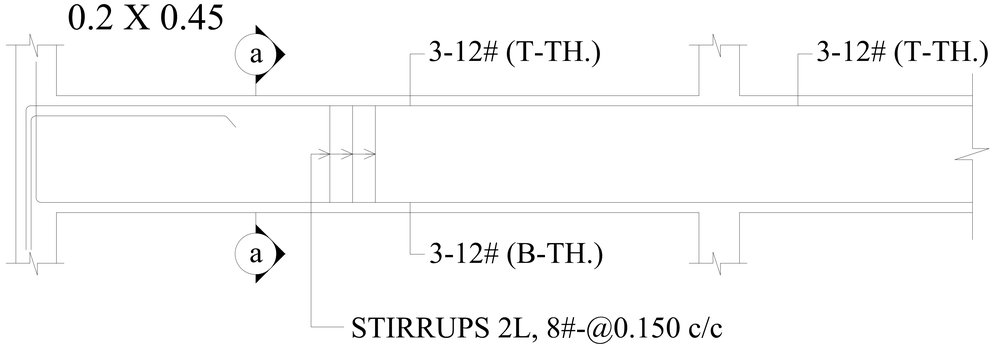
TYPICAL DETAIL OF BEAM

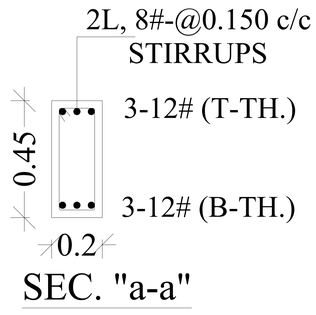
LEGENDS:-
T - TOP.
B - BOTTOM.
ST - STRAIGHT.
EX - EXTRA.
L - LEG.
R/F - REINFORCEMENT.
ALT. - ALTERNATE.

TYPICAL LINTEL BEAM LB1 :(0.2 X 0.2)



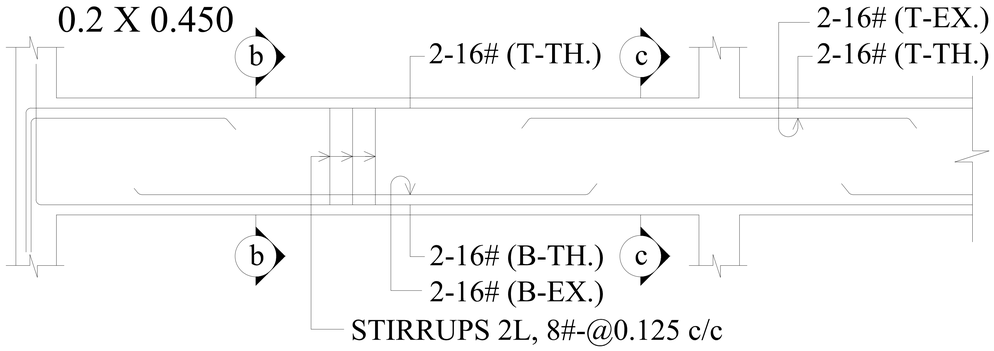
BEAM - SB1 : 0.2 X 0.45

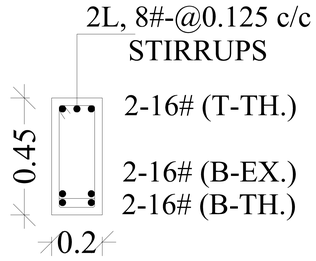




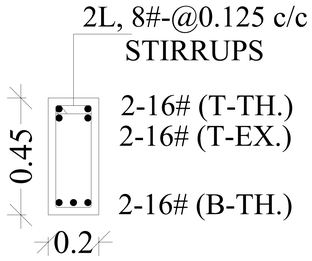
SEC. "a-a"

BEAM - SB2 : 0.2 X 0.450





SEC. "b-b"



SEC. "c-c"

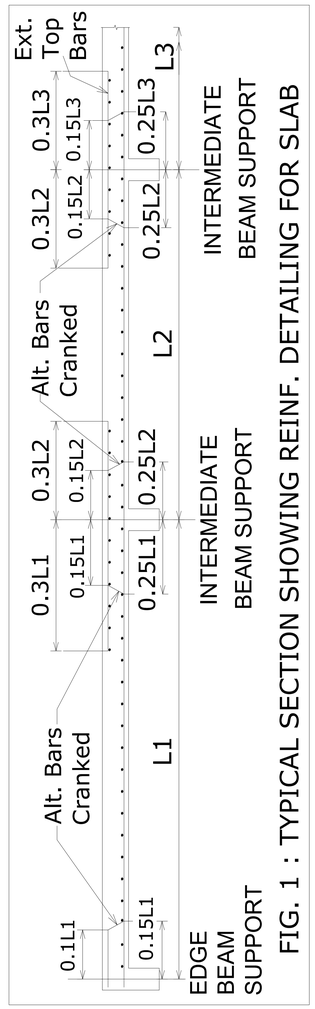


FIG. 1 : TYPICAL SECTION SHOWING REINF. DETAILING FOR SLAB

DETAILS OF SLAB REINFORCEMENT FOR GROUND FLOOR ROOF SLAB
(SEE FIG.-1 FOR POSITIONING AND DETAILING OF SLAB REINFORCEMENT)

NAME OF SLAB	DEPTH OF SLAB (METER)	REINFORCEMENT ALONG SHORT DIRECTION		REINFORCEMENT ALONG LONG DIRECTION		DISTRIBUTION R/F	SLAB TYPE
		AT MID SPAN NEAR BOTTOM FACE	OVER BEAM SUPPORT NEAR TOP FACE	AT MID SPAN NEAR BOTTOM FACE	OVER BEAM SUPPORT NEAR TOP FACE		
S1	0.125	8# - @0.125C/C	8# - @0.125C/C	8# - @0.125C/C	8# - @0.125C/C	-	2-WAY

NOTE:-

1. ALL DIMENSION ARE IN METERS, UNLESS STATED OTHERWISE.
2. THIS DRAWING MUST NOT BE SCALED; ONLY WRITTEN DIMENSIONS TO BE FOLLOWED.
3. ANY DISCREPANCY OBSERVED SHOULD BE IMMEDIATELY BROUGHT TO THE CONSULTANTS NOTICE.
4. CORRECT POSITIONING OF ALL REINFORCEMENT BARS SHALL BE STRICTLY ENSURED BEFORE POURING CONCRETE.
5. STRICT QUALITY CONTROL SHALL BE ENSURED FOR ALL MATERIAL AND CONSTRUCTION ACTIVITIES.
6. PROPER CURING OF CONCRETE , AS PER I.S: 456 - 2000, SHALL BE STRICTLY MAINTAINED.
7. USE:-
   a) HIGH YIELD STRENGTH DEFORMED STEEL BARS CONFORMING TO I.S. 1786 - 2008 WITH YIELD STRENGTH NOT LESS THAN 500 N/mm2. UNLESS SPECIFIED OTHERWISE.
   b) REINFORCED CEMENT CONCRETE - M-25 GRADE FOR ALL R.C.C WORK.
8. NO DEVIATIONS FROM THIS DRAWING SHOULD BE MADE WITHOUT A WRITTEN CONSENT FROM THE CONSULTANT.
9. CLEAR COVER : COLUMN -40 mm, FOOTING -50mm, BEAMS -25 mm & SLAB -20 mm.
10. WALL THICKNESS = 0.1m/0.2m.
11. SHUTTERING & SCAFFOLDING AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
12. STRIPPING TIME TABLE AS PER IS: 456-2000.

Type of Formwork	Minimum period before striking formwork
Vertical formwork to columns,walls and beams.	16 to 24 hours
Props to be Refixed immediately after removal of formwork.	
i) soffit formwork to Slabs	7 days
ii) soffit formwork to Beams	10 days
Props to Slabs:	
i) Slabs spanning up to 4.5m	10 days
ii) Slabs spanning over 4.5m	14 days
Props to beams and arches:	
i) Span up to 6m	14 days
ii) Span over 6m	21 days

13. ALL SAFETY MEASURES AT THE CONSTRUCTION SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
14. ALL LAPS (Ld) SHALL BE STAGGERED & NOT MORE THAN 50% BARS TO BE LAPPED AT ANY GIVEN SECTION.

GRADE OF REINF.	M20	M25	M30
Fe500 (TMT)	57 X D	49 X D	46 X D

FOR BUNDLED BARS, LD SHALL BE INCREASED BY 10% FOR 2 BARS IN CONTACT, 20% FOR 3 BARS IN CONTACT AND 33% FOR 4 BARS IN CONTACT.

15. THE WORK SHOULD BE CARRIED OUT UNDER STRICT SUPERVISION OF QUALIFIED CIVIL/STRUCTURAL ENGINEER.
16. SBC IS TAKEN 20.00 T/M2 AT 3.0m DEPTH FROM THE N.G.L. & WATER TABLE 2m BELOW THE N.G.L. LEVEL AS PER CLIENT.

DRG. No.:-	*STR/03*
REV. No.:-	*R1*
Date :-	*02 MAR 2023*

Project :-

JACK FRUIT PROCESSING UNIT AT SURAJPUR (C.G.)

Client :-

CGMFPFED NAYA RAIPUR , (C.G.)

Title :-

TERRACE FLOOR SLAB BEAM DETAILS