SYLLABUS

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL & DIE)- FULL TIME

II & III YEAR SYLLABUS

2015-2016

M - SCHEME

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU

Curriculum and Scheme of Examination

Diploma in Mechanical Engineering (Tool&Die)
M-Scheme (With effect from 2015-2016)

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DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY
(SEMESTER SYSTEM)

(Implemented from 2015- 2016)

M – SCHEME

R E G U L A T I O N S*

***** *Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology and the Diploma Courses offered through MGR Film Institute, Chennai.*

1. Description of the Course:

a. Full Time (3 years)

The Course for the full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Diploma in Engineering (sandwich) shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4^{th} and/or during 7^{th} semester the students undergo industrial training for six months/ one year. Industrial training examination will be conducted after completion of every 6 months of industrial training

c. Part Time (4 years)

The course for the diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3 year full time diploma courses being regrouped for academic convenience.

* Each Semester will have 15 weeks duration of study with 35 hrs. /Week for Regular Diploma Programme and 18hrs/ week (21 hrs. / Week I year) for Part-Time Diploma Programmes.

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2015 – 2016 academic year onwards.

2. Condition for Admission:

Condition for admission to the diploma courses shall be required to have passed in The S.S.L.C Examination of the Board of Secondary Education, TamilNadu.

(Or)

The Anglo Indian High School Examination with eligibility for Higher Secondary Course in TamilNadu.

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examination recognized as equivalent to the above by the Board of Secondary Education, TamilNadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (Academic) or (Vocational) courses mentioned in the Higher Secondary Schools in TamilNadu affiliated to the TamilNadu Higher Secondary Board with eligibility for university Courses of study or equivalent examination, & Should have studied the following subjects.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational	
		Subjects Studied	Subjects Studied	
			Related subjects	Vocational subjects
1.	All the Regular and Sandwich Diploma Courses	Maths, Physics & Chemistry	Maths / Physics / Chemistry	Related Vocational Subjects Theory & Practical
2.	Diploma course in Modern Office Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretaryship.

- For the diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practical may also be taken for arriving the eligibility.

- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.

- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Modern Office Practice Diploma courses the candidates studied the related subjects will be given first preference.

- *Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.*

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, TamilNadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses are as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time(Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical. The curriculum outline is given in Annexure **- I**

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The Internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment and 75 marks are allotted for Board Examination.

9. Continuous Internal Assessment:

A . For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

i. Subject Attendance **5 Marks**

(Award of marks for subject attendance to each subject theory/practical will as per the range given below)

80% - 83%	)	1 Mark
84% - 87%		2 Marks
88% - 91%		3 Marks
92% - 95%		4 Marks
96% - 100%		5 Marks

ii) Test # **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Out of which the best one will be taken and the marks to be reduced to: 05 marks

The Test – III is to be the Model test covering all the five units and the marks so obtained will be reduced to : 05 marks

Total **10 marks**

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	**Model Examination** - **Compulsory** Covering all the 5 Units. (Board Examination-question paper-pattern).	End of 15th week	75	3 Hrs

 # - From the Academic year 2015-2016 onwards.

Question Paper Pattern for the Periodical Test :(Test - I & Test- II)

With no choice:

PART A type questions:	4 Questions X 2 mark	… … 8 marks
PART B type questions:	4 Questions X 3 marks	… … 12 marks
PART C type questions:	3 Questions X 10 marks	… … 30 marks

	Total	50 marks
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iii) Assignment **10 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 10 marks

All Test Papers and assignment notebooks after getting the signature with date from the students must be kept in the safe custody in the Department for verification and audit. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

B. For Practical Subjects:

The internal assessment mark for a total of 25 marks which are to be distributed as follows:-

a)	Attendance (Award of marks as same as Theory subjects)	: **5**	**Marks**
b)	Procedure/ observation and tabulation/ Other Practical related Work	: **10**	**Marks**
c)	Record writing	: **10**	**Marks**

	TOTAL	: **25**	**Marks**

- *All the Experiments/exercises indicated in the syllabus should be completed and the same to be given for final board examinations.*
- The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.
- At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)

- The students have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.
- *All the marks awarded for assignment, Test and attendance should be entered in the Personal Log Book of the staff, who is handling the subject. This is applicable to both Theory and Practical subjects.*

10. Life and Employability Skill Practical:

The Life and Employability Skill Practical with more emphasis is being introduced in IV Semester for Circuit Branches and in V Semester for other branches of Engineering.
Much Stress is given to increase the employability of the students:

Internal assessment Mark **….. 25 Marks**

11. Project Work:

The students of all the Diploma Programmes **(except Diploma in Modern Office Practice)** have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester.**

a) Internal assessment mark for Project Work & Viva Voce:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks** (award of marks same as theory subjects pattern)
Total	…	**25 marks**

Proper record to be maintained for the two Project Reviews, and It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Mark for Project Work & Viva Voce in Board Examination:

Viva Voce	…	**30 marks**
Marks for Report Preparation, Demo	…	**35 marks**
Total		**65 marks**

c) Written Test Mark (from 2 topics for 30 minutes duration): $

i) Environment Management	2 questions X 2 ½ marks	= **5 marks**
iI) Disaster Management	2 questions X 2 ½ marks	= **5 marks**
		10marks

$ **-** Selection of Questions should be from Question Bank, by the External Examiner. No choice need be given to the candidates.

Project Work & Viva Voce in Board Examination	--	**65 Marks**
Written Test Mark (from 2 topics for 30 minutes duration)	--	**10 Marks**
TOTAL	--	**75 Marks**

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual during the Project Work & Viva Voce Board examination.

12. Scheme of Examinations:

The Scheme of examinations for subjects is given in **Annexure - II.**

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than *40% in theory subjects* and *50% in practical subject* out of the total prescribed maximum marks including both the internal assessment and the Board Examination marks put together, subject to the condition that he/she secures at least a minimum of *30 marks out of 75 marks in the Board's Theory examinations and a minimum of 35 marks out of 75 marks in the Board Practical Examinations.*

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2018 onwards (Joined in first year in 2015-2016) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 3/ 3½/ 4 years (Full Time/Sandwich/Part Time) without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate of marks in all the semesters put together and passes all the semesters except the I and II semesters in the first appearance itself and passes all the subjects within the stipulated period of study 3/ 3½/ 4 years (Full Time/Sandwich/Part Time) without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all semesters put together and passes all the subjects within the stipulated period of study 3/ 3½ / 4 years (Full Time/Sandwich/Part Time) without any break in study.

Second Class:

All other successful candidates will be declared to have passed in **Second Class.**

The above mentioned classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2018 /April 2019 onwards (both joined in First Year in 2015-2016)

15. Duration of a period in the Class Time Table:

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and Lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

16. Seminar:

For seminar the total seminar 15 hours(15 weeks x 1hour) should be distributed equally to total theory subject per semester(i.e 15 hours divided by 3/4 subject). A topic from subject or current scenario is given to students. During the seminar hour students have to present the paper and submit seminar material to the respective staff member, who is handling the subject. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

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SALIENT FEATURES OF M SCHEME CURRICULUM AND SYLLABUS OF II & III YEAR DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE) COURSE

1) Duration of the semester reduced from 16 weeks to 15 weeks as done in the I and II semester M Scheme curriculum.
2) Resolved to adopt the following subjects as common with Diploma in Mechanical Engineering course.
    i. Strength of Materials (III Semester)
    ii. Communication and Life skills practical (V Semester)
    iii. Industrial Engineering and Management (VI Semester)
    iv. Computer Aided Design and Manufacturing (VI Semester)
    v. Computer Aided Design and Manufacturing Practical (VI Semester)
    vi. Project Work (VI Semester)

3) **Machine drawing** subject in III semester, L scheme, has been modified duly including the Tool Assembly drawing exercises and renamed as **Machine and Tool Drawing**. The model Tool assembly drawings (both detail and assembly drawings) for all the exercises newly added are also given in the curriculum.

4) **Computer Aided Machine drawing Practical** subject in IV semester, L scheme, has been modified duly including the Tool Assembly drawing exercises and renamed as **Computer Aided Machine and Tool Drawing Practical**. The model Tool assembly drawings (both detail and assembly drawings) for all the exercises newly added are also given in the curriculum.

5) **Forging Dies and Die Casting dies subject** in V semester, L scheme, has been renamed as **Forging Dies, Die casting dies and Die maintenance** duly including the basic concepts of die maintenance.

6) Considering the employment potential in the field of Die maintenance, fundamentals of die maintenance, trouble shooting, die repair and die maintenance are included in the subject Forging dies, die casting dies and Die maintenance.

7) For the following Tool making practical subjects, to ensure uniformity among the Institutions, the component, detail and assembly drawings with dimensions are provided in the curriculum.
    a. Press Tool - I Practical – V semester
    b. Jigs & Fixtures Practical – V Semester
    c. Press Tool – II Practical – VI Semester
    d. Plastic Moulds Practical – VI Semester

8) The subject wise details of other changes done are as follows:

Sl.No	Name of the Subject	Theory / Practical	Sem	Details of changes done
1.	Manufacturing Technology	Theory	III	1. Syllabus restructured. 2. Newer Manufacturing Technologies included. 3. Basics of Forging Processes shifted from the subject Forging dies and die casting dies in V semester to this subject and includes as Unit III.
2.	Machine and Tool Drawing	Theory	III	1. Tool assembly exercises Viz., Drill Jig, Welding Fixture, Blanking Tool assembly and Injection moulding Tool Assembly included. 2. Total number of Exercises reduced from 14 to 12.
3.	Manufacturing Technology Practical	Practical	III	1. Number of thread cutting practical reduced from 5 to 3. 2. Demo in smithy operations included.
4.	Engineering Materials and Metallurgy	Theory	IV	1. Syllabus restructured.
5.	Tool Room Special Machines	Theory	IV	1. Syllabus restructured. 2. CNC machine and its components added
6.	Computer Aided Machine Drawing Practical	Practical	IV	1. Tool assembly exercises Viz., Drill Jig, Welding Fixture, Blanking Tool assembly and Injection moulding Tool Assembly included. 2. Total number of Exercises reduced from 14 to 13. 3. Detail and Assembly drawings for Tools are included.
7.	Tool Room Special Machines Practical	Practical	IV	1. Total number of exercises reduced from 14 to 10.
8.	Jigs, Fixture & Gauges	Theory	V	1. Syllabus restructured. 2. Jig and Fixture design procedures and examples added.

9.	Forging dies, Die casting dies and Die maintenance	Theory	V	1. Subject name renamed as **Forging Dies, Die casting dies and Die maintenance** duly including the basic concepts of die maintenance. 2. Considering the employment potential in the field of Die maintenance, fundamentals of die maintenance, trouble shooting, die repair and die maintenance are included in the subject Forging dies, die casting dies and Die maintenance. 3. Basics of Forging Processes shifted to Manufacturing Technology subject in III Semester.
10.	Tool Design and Drawing	Theory	V	1. Syllabus restructured. 2. Question paper pattern changed to provide sufficient time to answer the design questions.

ANNEXURE – I

CURRICULUM OUTLINE (M SCHEME)

THIRD SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
32031	Strength of Materials@@	6	-	-	6
32232	Manufacturing Technology	5	-	-	5
32233	Engineering Metrology	5	-	-	5
32234	Machine and Tool Drawing	2	4	-	6
32235	Engineering Metrology Practical	-	-	3	3
32236	Manufacturing Technology Practical	-	-	5	5
30001	Computer Applications Practical $$	-	-	4	4
	Seminar	1	-	-	1
TOTAL		19	4	12	**35**

FOURTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
32241	Engineering Materials and Metallurgy	5	-	-	5
32242	Fluid Power and Thermal Engineering	5	-	-	5
32243	Tool Room Special Machines	5	-	-	5
32244	Computer Aided Machine and Tool Drawing Practical	-	-	5	5
32245	Mechanical Material Testing Practical	-	-	4	4
32246	Hydraulics and Pneumatics Practical	-	-	4	4
32247	Tool Room Special Machines Practical	-	-	6	6
	Seminar	1	-	-	1
TOTAL		16	-	19	35

CURRICULUM OUTLINE (M SCHEME)

FIFTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
32251	Jigs, Fixtures and Gauges	5	-	-	5
32252	Press Tools	5	-	-	5
32253	Forging Dies , Die casting dies and Die maintenance	5	-	-	5
32254	Tool Design and Drawing	2	4	-	6
32255	Press Tools - I Practical	-	-	5	5
32256	Jigs and Fixtures Practical	-	-	4	4
30002	Life and Employability skill Practical $$	-	-	4	4
	Seminar	1	-	-	1
TOTAL		18	4	13	**35**

SIXTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
32061	Industrial Engineering and Management@@	6	-	-	6
32062	Computer Aided Design and Manufacturing @@	5	-	-	5
32263	Plastic Molding Technology	5	-	-	5
32064	Computer Aided Design and Manufacturing Practical @@	-	-	6	6
32265	Press tools – II Practical	-	-	4	4
32266	Plastic Molds Practical	-	-	4	4
32267	Project Work	-	-	4	4
	Seminar	1	-	-	1
TOTAL		17	-	18	**35**

@@ - Papers Common with Diploma in Mechanical Engineering Branch

$$ - Paper common with other branches of Engineering.

ANNEXURE - II
SCHEME OF THE EXAMINATION (M SCHEME)

THIRD SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
32031	Strength of Materials[@@]	25	75	100	40	3
32232	Manufacturing Technology	25	75	100	40	3
32233	Engineering Metrology	25	75	100	40	3
32234	Machine and Tool Drawing	25	75	100	40	3
32235	Engineering Metrology Practical	25	75	100	50	3
32236	Manufacturing Technology Practical	25	75	100	50	3
30001	Computer Applications Practical[$$]	25	75	100	50	3
		175	**525**	**700**		

FOURTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks	Total Mark		
32241	Engineering Materials and Metallurgy	25	75	100	40	3
32242	Fluid Power and Thermal Engineering	25	75	100	40	3
32243	Tool Room Special Machines	25	75	100	40	3
32244	Computer Aided Machine and Tool Drawing Practical	25	75	100	50	3
32245	Mechanical Material Testing Practical	25	75	100	50	3
32246	Hydraulics and Pneumatics Practical	25	75	100	50	3
32247	Tool Room Special Machines Practical	25	75	100	50	3
TOTAL		**175**	**525**	**700**		

SCHEME OF THE EXAMINATION

FIFTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam. Marks	Total Mark		
32251	Jigs, Fixtures and Gauges	25	75	100	40	3
32252	Press Tools	25	75	100	40	3
32253	Forging Dies , Die casting dies and Die maintenance	25	75	100	40	3
32254	Tool Design and Drawing	25	75	100	40	3
32255	Press Tools - I Practical	25	75	100	50	16
32256	Jigs and Fixtures Practical	25	75	100	50	16
30002	Life and Employability skill practical $$	25	75	100	50	3
		175	**525**	**700**		

SIXTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment Marks	Board Exam Marks	Total Mark		
32061	Industrial Engineering and Management@@	25	75	100	40	3
32062	Computer Aided Design and Manufacturing @@	25	75	100	40	3
32263	Plastic Moulding Technology	25	75	100	40	3
32064	Computer Aided Design and Manufacturing Practical @@	25	75	100	50	3
32265	Press tools – II Practical	25	75	100	50	16
32266	Plastic Moulds Practical	25	75	100	50	16
32267	Project Work @@	25	75	100	50	3
TOTAL		**175**	**525**	**700**		

@@ - Papers Common with Diploma in Mechanical Engineering Branch
$$- Papers common with other branches of Engineering

Diploma in Mechanical Engineering (Tool & Die)

List of Alternate Subjects for L-Scheme subjects

III SEMESTER w.e.f. OCT '16

L-SCHEME			M-SCHEME	
S.No.	Subject Code	Name of the Subject	**Subject Code**	**Name of the Subject**
1.	22031	Strength of Materials@@	**32031**	**Strength of Materials @@**
2.	22232	Manufacturing Technology	**32232**	**Manufacturing Technology**
3.	22233	Engineering Metrology	**32233**	**Engineering Metrology**
4.	22034	Machine Drawing@@	**32033**	**Machine Drawing@@**
5.	22235	Engineering Metrology Practical	**32235**	**Engineering Metrology Practical**
6.	22236	Manufacturing Technology Practical	**32236**	**Manufacturing Technology Practical**
7.	20001	Computer Applications Practical $$	**30001**	**Computer Applications Practical $$**

IV SEMESTER – w.e.f. APR '17

L-SCHEME			M-SCHEME	
S.No.	Subject Code	Name of the Subject	**Subject Code**	**Name of the Subject**
1.	22241	Engineering Materials and Metallurgy	**32241**	Engineering Materials and Metallurgy
2.	22242	Fluid Power and Thermal Engineering	**32242**	Fluid Power and Thermal Engineering
3.	22243	Tool Room Special Machines	**32243**	Tool Room Special Machines
4.	22044	Computer Aided Machine drawing practical	**---**	No alternate subject
5.	22245	Mechanical Material Testing Practical	**32245**	Mechanical Material Testing Practical
6.	22246	Hydraulics and Pneumatics Practical	**32246**	Hydraulics and Pneumatics Practical
7.	22247	Tool Room Special Machines Practical	**32247**	Tool Room Special Machines Practical

@@ - Papers Common with Diploma in Mechanical Engineering Branch

V SEMESTER – w.e.f. OCT '17

L - SCHEME			M - SCHEME	
S.No.	Subject Code	Name of the Subject	**Subject Code**	**Name of the Subject**
1.	22251	Jigs, Fixtures and Gauges	**32251**	Jigs, Fixtures and Gauges
2.	22252	Press Tools	**32252**	Press Tools
3.	22253	Forging Dies and Die casting dies	**---**	No alternate subject
4.	22254	Tool Design and Drawing	**32254**	Tool Design and Drawing
5.	22255	Press Tools - I Practical	**32255**	Press Tools - I Practical
6.	22256	Jigs and Fixtures Practical	**32256**	Jigs and Fixtures Practical
7.	20002	Communication and Life skills practical$^{\$\$}$	**30002**	Life and Employability skill Practical $^{\$\$}$

VI SEMESTER – w.e.f. APR '18

L - SCHEME			M -SCHEME	
S.No.	Subject Code	Name of the Subject	**Subject Code**	**Name of the Subject**
1.	22061	Industrial Engineering and Management$^{@@}$	**32061**	Industrial Engineering and Management $^{@@}$
2.	22062	Computer Integrated Manufacturing$^{@@}$	**32062**	Computer Aided Design and Manufacturing $^{@@}$
3.	22263	Plastic Moulding Technology	**32263**	Plastic Moulding Technology
4.	22064	Computer Integrated Manufacturing Practical $^{@@}$	**32064**	Computer Aided Design and Manufacturing Practical $^{@@}$
5.	22265	Press Tools – II Practical	**32265**	Press tools – II Practical
5.	22266	Plastic Moulds Practical	**32266**	Plastic Moulds Practical
6.	22267	Project Work$^{@@}$	**32267**	Project Work $^{@@}$

@@ - Papers Common with Diploma in Mechanical Engineering Branch
$$- Papers common with other branches of Engineering

Board Examination - Question paper pattern

Common for all theory subjects unless it is specified

PART A ***- (1 to 8) 5 Questions are to be answered out of 8 questions for 2 marks each.*****(Question No. 8 will be the compulsory question and *can be asked from any one of the units)(From each unit maximum of two 2 marks questions alone can be asked)***

PART B ***- (9 to 16)5 Questions are to be answered out of 8 questions for 3 marks each.*** **(Question No. 16 will be the compulsory question and *can be asked from any one of the units) (From each unit maximum of two 3 marks questions alone can be asked)***

PART C ***- (17 to 21) Five Questions will be in the Either OR Pattern. Students have to answer these five questions. Each question carries 10 marks. (Based on the discretion of the question setter, he/she can ask two five mark questions (with sub division A & sub division B) instead of one ten marks question if required)***

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

32031 – STRENGTH OF MATERIALS

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOO & TIE)

Course Code : 1220

Subject Code : 32031

Semester : III

Subject Title : **STRENGTH OF MATERIALS**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
Strength of Materials	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	STATICS OF PARTICLE AND FRICTION	17
II	MECHANICAL PROPERTIES, SIMPLE STRESSES AND STRAINS	17
III	GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS	17
IV	SHEAR FORCE AND BENDING MOMENT DIAGRAMS, THEORY OF SIMPLE BENDING	16
V	TORSION AND SPRINGS	16
	TEST AND REVISION	7
	Total	**90**

RATIONALE:

Day by day, engineering and technology experience tremendous growth. Design plays a major role in developing engineering and technology. Strength of material is backbone for design. The strength of material deals generally with the behaviour of objects, when they are subject to actions of forces. Evaluations derived from these basic fields provide the tools for investigation of mechanical structure.

OBJECTIVES

- Define various Support reaction and equilibrium.
- Calculate the deformation of materials, which are subjected to axial load and shear.
- Determine the moment of Inertia of various sections used in industries.
- Estimate the stresses induced in thin shells.
- Draw the shear force and bending moment diagram of the beam for different loads.

STRENGTH OF MATERIALS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**STATICS OF PARTICLES:** Introduction – Force - effects of a force - system of forces - resultant of force - Principle of transmissibility - parallelogram law of forces - triangular law - resultant of several forces acting on a particle - polygon law - resolution of a force into rectangular components – resultant of a system of forces acting on a particle using rectangular components - equilibrium of particles. External and internal forces - moment of a force - Varignon's theorem - moment of a couple - equivalent couples - addition of couples - resolution of a force into a force and a couple - Free body diagram - Necessary and sufficient conditions for the equilibrium of rigid bodies in two dimension - Support reaction - types of support - removal of two dimensional supports - Simple problems only.	17

	FRICTION: Introduction - Definition - Force of friction - Limiting friction - Static friction - Dynamic friction - Angle of friction - co-efficient of friction - Laws of static and dynamic friction.	
II	**DEFORMATION OF METALS** **Mechanical properties of materials:** Engineering materials – Ferrous and non-ferrous materials **-** Definition of mechanical properties - Alloying elements-effect of alloying element - Fatigue, fatigue strength, creep – temperature creep – cyclic loading and repeated loading – endurance limit. **Simple stresses and strains:** Definition – Load, stress and strain – Classification of force systems – tensile, compressive and shear force systems – Behaviour of mild steel in tension up to rupture – Stress – Strain diagram – limit of proportionality – elastic limit – yield stress – breaking stress – Ultimate stress – percentage of elongation and percentage reduction in area – Hooke's law – Definition – Young's modulus - working stress, factor of safety, load factor, shear stress and shear strain - modulus of rigidity. Linear strain – Deformation due to tension and compressive force – Simple problems in tension, compression and shear force. Definition – Lateral strain – Poisson's ratio – volumetric strain – bulk modulus – volumetric strain of rectangular and circular bars – problems connecting linear, lateral and volumetric deformation – Elastic constants and their relationship - Problems on elastic constants - Definition – Composite bar – Problem in composite bars subjected to tension and compression – Temperature stresses and strains – Simple problems – Definition – strain energy – proof resilience – modulus of resilience – The expression for strain energy stored in a bar due to Axial load – Instantaneous stresses due to gradual, sudden, impact and shock loads – Problems computing instantaneous stress and deformation in gradual, sudden, impact and shock loadings.	**17**

III	**GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS** **Properties of sections:** Definition – center of gravity and centroid - position of centroids of plane geometrical figures such as rectangle, triangle, circle and trapezium-problems to determine the centroid of angle, channel, T and I sections only - Definition-centroidal axis-Axis of symmetry. Moment of Inertia – Statement of parallel axis theorem and perpendicular axis theorem. Moment of Inertia of lamina of rectangle, circle, triangle, I and channel sections-Definition-Polar moment of Inertia-radius of gyration – Problems computing moment of inertia and radius of gyration for angle, T, Channel and I sections. **Thin Shells:** Definition – Thin and thick cylindrical shell – Failure of thin cylindrical shell subjected to internal pressure – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – change in dimensions of a thin cylindrical shell subjected to internal pressure – problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.	**17**
IV	**SF AND BM DIAGRAMS OF BEAMS AND THEORY OF BENDING** Classification of beams – Definition – shear force and Bending moment – sign conventions for shear force and bending moment – types of loadings – Relationship between load, force and bending moment at a section – shear force diagram and bending moment diagram of cantilever and simply supported beam subjected to point load and uniformly distributed load (udl) – Determination of Maximum bending moment in cantilever beam and simply supported beam when they are subjected to point load and uniformly distributed load. Theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – bending equation – M/I=f/y=E/R – Definition – section modulus - rectangular and circular	**16**

	sections – strength of beam – simple problems involving flexural formula for cantilever and simple supported beam.	
V	**THEORY OF TORSION AND SPRINGS** Theory of torsion – Assumptions – torsion equation $\frac{T}{J} = \frac{f_s}{R} = \frac{C\theta}{l}$ – strength of solid and hollow shafts – power transmitted – Definition – Polar modulus – Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strength considerations – Advantages of hollow shafts over solid shafts – Problems. Types of springs – Laminated and coiled springs and applications – Types of coiled springs – Difference between open and closely coiled helical springs – closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs	**16**

Text Books:

1) Strength of Materials, R. S. Khurmi, S.Chand & Co., Ram Nagar, New Delhi.
2) Strength of Materials, S. Ramamrutham, 15th Edn 2004, DhanpatRai Pub. Co., New Delhi.

Reference Books:

1) Strength of Materials, R.K. Bansal,, Laxmi Publications Pvt. Ltd., New Delhi, 3rd Edition, 2010.
2) Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
3) Strength of Materials, B K Sarkar, I Edition, 2003 Tata Mcgraw hill, New Delhi.
4) Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 2nd Edition, 2007

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

32232 – MANUFACTURING TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL&DIE)
Course Code : 1220
Subject Code : 32232
Semester : III
Subject Title : **MANUFACTURING TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: **15 weeks**

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MANUFACTURING TECHNOLOGY	5	75	25	75	100	3 Hrs.

TOPICS AND ALLOCATION OF HOURS:

UNIT No.	TOPIC	TIME (Hrs)
I	CASTING PROCESSES	14
II	METAL JOINING PROCESSES	14
III	FORGING AND FORGING MACHINES	14
IV	LATHE, AND DRILLING MACHINES	14
V	PLANER, SHAPER, SLOTTER AND GRINDING MACHINES	14
	TEST & REVISION	05
	TOTAL	**75**

RATIONALE:

To be a mechanical engineer, it is necessary to understand the various present technologies that are being used in the process of conversion of raw materials into finished products. So it is very essential to learn the basics of various present technologies and processes that are available and predominantly used in the industries.

OBJECTIVES:

- Acquire knowledge about types of patterns, types of moulding and casting processes
- Acquire knowledge about various metal joining processes
- Appreciate the safety practices used in welding
- Understand the principles of forging and its processes.
- Explain the various types of forging machines.
- Explain the lathe working principles and its various operations
- Explain the drilling and drilling machine principles and its various operations
- Describe the working of planer, shaper and slotter
- Explain the grinding machine and types of grinding wheels

32232 - MANUFACTURING TECHNOLOGY
DETAILED SYLLABUS

Contents: Theory

Unit No.	Name of the Topics	Hours
I	**CASTING PROCESSES** **Patterns**– Definition – pattern materials – factors for selecting pattern materials– single piece solid, split patterns – pattern allowances – core prints – color coding patterns. Moulding – definition – moulding boxes, moulding sand – ingredients – silica – clay – moisture and miscellaneous materials – properties of moulding sand –sand additives – moulding sand preparation – mixing – tempering and conditioning – types of moulding – green sand – dry sand – machine moulding –Top and bottom squeezer machines – Jolting machines – sand slinger- core –CO_2 process core making – types of core – core boxes. **Casting**– Definition – sand casting using green sand and dry sand – gravity die casting – pressure die casting: hot and cold chamber processes – centrifugal casting – continuous casting – chilled casting – malleable casting – melting of cast iron – cupola furnace – melting of non ferrous metals – crucible furnace melting of steel - arc furnaces – induction furnaces – instrument for measuring temperature – optical pyrometer – thermo electric pyrometer – cleaning of casting – tumbling, trimming, sand and shot blasting – defects in casting, causes and their remedies – safety practices in foundry.	**14**
II	**METAL JOINING PROCESSES** **Arc Welding -** Definition – Arc welding equipment – arc welding methods –carbon arc, metal arc, Metal Inert gas (MIG), Tungsten inert gas (TIG), Atomic hydrogen, Plasma arc, Submerged arc and Electro slag welding, **Gas welding -** Definition Gas Welding Equipment– Oxy and acetylene welding -Three types of flame. **Resistance welding** – Classification of resistance welding –butt – spot – seam – projection welding – welding related processes – oxy and acetylene cutting – arc cutting – hard facing bronze welding. Soldering and brazing - special welding processes: cast iron welding – thermit-welding – solid slate welding, ultrasonic, diffusion	**14**

	and explosive welding – explosive cladding. **Modern welding**: Electron beam and laser beam welding – types of welded joints- inspection and testing of welded joints –destructive and non destructive types of tests - safety practices in welding.	
III	**FORGING AND FORGING MACHINES** **Introduction to Forgings:** Uses and advantages of forgings, forged parts Vs cast parts, Forging Temperatures, annealing of forgings, forging properties. forgeability and forgeable metals **Forging processes**: Hot-working and cold-working – Advantages – comparison – hot-working operations: rolling, forging, smith forging, drop forging, upset forging press forging – roll forging – Roll die forging, , skew rolling, ring rolling - power required calculations for rolling and forging operations. Forging dies– drop hammers- board hammers, air lift hammers, power drop hammers, capacity of drop hammers. Press forging – Mechanical forging presses, Hydraulic press. Comparison of press forging Vs hammer forging. Machine or upset forgings. Heat treatment of forged parts **Heating devices**–Box or batch type furnaces, rotary hearth furnaces, continuous or conveyor furnaces, induction furnaces, resistance furnaces. Open fire and stock fire.	**14**
IV	**LATHE AND DRILLING MACHINES** **Centre Lathe**: Theory of lathes – specifications – simple sketches – principal parts and its functions –tumbler gear mechanism – quick change gear box – apron mechanism – carriage cross slide– automatic, longitudinal and cross feed mechanism – work holding devices: face plate, three jaw chuck, four jaw chuck, catch-plate and carrier – types of centres – machining operations done on lathe: facing, plain turning, step turning, taper turning, knurling, thread cutting, boring, chamfering –major machining parameters. **Drilling Machines**: Drills: flat drills, twist drills – nomenclature-types of drilling machines: bench type, floor type, radial type, gang drill, multi-spindle type-principle of operation in drilling – drilling parameters for various materials -methods of holding drill bit: drill chucks, socket and sleeve –drilling operation: drilling, boring, reaming, counter sinking, counter boring, spot facing, tapping, deep hole drilling.	**14**
V	**PLANER, SHAPER, SLOTTER AND GRINDING MACHINES** **Planer**: Types of planer – specifications-principles of operation-quick return mechanism-feed mechanism- work holding devices-types of planer operation.	**14**

	Shaper: Types of shaper– specifications-principles of operations-quick return mechanism-crank and slotted link mechanism -feed mechanism-work holding devices – types of shaper operations. **Slotter**: Types of slotter – specifications – principle of operation – Whitworth quick return mechanism-feed mechanism-work holding devices. **Grinding Machines**: Types and classification – specifications - principles of operations-grinding wheels abrasives: natural and artificial - types of bonds-grit, grade and structure of wheels-wheel shapes and sizes – BIS marking systems of grinding wheels-selection of grinding wheel-mounting of grinding wheels- dressing and truing of wheels- balancing of grinding wheels.	
	TEST & REVISION	**05**

Text Books

1. Hajra Chowdry & Bhattacharaya, Elements of workshop Technology Volume I & II, Edn. XI,Media Promoters & Publishers Pvt. Ltd., Seewai Building `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. R. S. Khurmi & J. K. Gupta, A Text book of workshop Technology, Edn. 2, S.Chand & Co.,Ram Nagar, New Delhi - 2002.

Reference Books:

1. Begeman, Manufacturing process, Edn. 5, McGraw Hill, New Delhi 1981.
   WAJ Chapman, Workshop Technology, Volume I, II, & III, Vima Books Pvt. Ltd., 4262/3,Ansari Road, Daryaganj, New Delhi 110 002.
2. Raghuwanshi, Workshop Technology, Khanna Publishers. Jain & Gupta, Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 2006
3. P. C. SHARMA, Production Technology, Edn. X, S.Chand & Co. Ltd., Ram Nagar, NewDelhi 110 055 - 2006
4. HMT, Production Technology, Edn. 18, published by Tata McGraw Hill publishing Co. Ltd., 7 West Patel Nagar, New Delhi 110 008. – 2001.
5. Kalpakjian, Manufacturing Engineering & Technology.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

32233 – ENGINEERING METROLOGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL&DIE)
Course Code : 1220
Subject Code : 32233
Semester : III
Subject Title : **ENGINEERING METROLOGY**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester**: 15 weeks**

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration (Hrs)
			Internal Assessment Marks	Board Exam Marks	Total	
Engineering Metrology	5	75	25	75	100	3

TOPICS AND TIME ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I	Introduction to Metrology and Linear Measurement	14
II	Angular Measurement, Measurement of Gears and Threads	14
III	Measurement of Geometric Parameters And Surface Finish	14
IV	Comparators And Measurement By Light Wave Interference	14
V	Measuring Machines and Recent Trends In Metrology	14
	TEST & REVISION	05
	Total	75

Rationale:-

The modern industries demand wide knowledge in the understanding and use of conventional and advanced digital measuring instruments that are being used in the process of manufacture of goods. Hence it is essential to have better understanding of the various measuring techniques and the technology that are being used in the various measuring instruments. The fundamentals of various measuring technique needs to be known to understand the modern measuring equipments that are being used in Industries.

OBJECTIVES

The objective of this course is to make the Student:

- To understand the Needs & Objectives of metrology.
- To understand about the various linear & angular measuring Instruments.
- To Study about the various Measurement Techniques.
- To Calibrate an Instrument.
- To know about various geometric parameters.
- To use Light rays in Measuring an Object.
- To Measure Force, Torque and temperature.
- To know about the measuring machines.
- To acquire Knowledge about Recent Trends in Metrology.

32233 - ENGINEERING METROLOGY

DETAILED SYLLABUS

Contents: Theory

Unit No.	Name of the Topics	Hours
I	**Introduction to Metrology and Linear Measurement:** **1.1 Introduction:** Metrology, objectives of metrology, Precision vs Accuracy. Repeatability, calibration, sensitivity and readability, classification of methods of measurement, general care of equipments. **1.2 Non precision Linear Measurements:** Surface plates, Tool maker's flats and high precision surface plates, Angle plates, bench centers, v-blocks, straight edges, Toolmaker's straight edges, using a straight edge, sprit levels, combination set, universal surface gauge, Engineer's square, Engineer's parallel, Radius gauge, feeler gauge, screw pitch gauge, Engineer's taper, wire and thickness gauge. **1.3 Precision Linear Measurements:** Characteristics and principles of precision measuring instruments. Vernier instruments, types of vernier calipers, errors in calipers, Vernier height gauge, Vernier depth gauge, digital readout height gauge. Micrometers – Internal micrometers, micrometer depth gauge, thread micrometer, v-anvil micrometer, dial micrometers, digital micrometers, groove micrometer. Telescope internal gauge, Measuring dia of deep holes, cylinder gauges, Keilpart gauge, slip gauges.	14
II	**Angular Measurement, Measurement of Gears and Threads:** **2.1 Angular Measurement:** Instruments for angular measurement-optical bevel protractor, universal bevel protractor, acute angle attachment, optical dividing head, Sine bars, Sine center, angle gauges, clinometers. **2.2 Optical instruments for angular measurement**: - Autocollimator – principle of the autocollimator, micro optic autocollimator, measurement of straightness and flatness. Angle dekkor – working principle, use of angle dekkor in combination with angle gauges. Optical square. **2.3 Measurement of Gears:** Gear tooth terminology, Gear tooth vernier caliper, Base tangent method, Composite method of Gear checking, Parkinson's Gear tester, Master Gear.	14

	2.4 **Thread Measurements**: Screw thread projection, Tool Maker's Microscope, Measurement of Effective Diameter, One wire, Two wire and Three wire Methods using floating carriage micrometer.	
III	**<u>Measurement of Geometric Parameters And Surface Finish :</u>** **3.1 Straightness, Flatness, Parallelism and squareness:** - Definition of straightness, straight edge and its use, test for straightness by using spirit level and Autocollimator, Flatness definition, flatness testing, procedure for determining flatness, laser equipment for alignment testing. Parallelism definition, various cases of parallelism of lines and planes, measurement of equidistance, checking of coincidence or alignment. Squareness definition, measurement of squareness of lines and planes, checking the perpendicularity of motion, squareness testing methods – indicator method, Engineer's square tester, optical tests for squareness. **3.2 Circularity and Rotation:** - Circularity definition, measurement of circularity, Different types of irregularities of a circular part – ovality, lobbing, irregularities of non specific form. Roundness and circularity. Devices for measuring circularity error – V block, precision measuring instruments. Tests for checking Rotation – Run out, measurement of run out, Periodical axial slip, camming. **3.3 Surface Finish:** - Surface roughness – definition, terminologies as per BIS, Methods of measuring Surface finish, surface finish parameters – Surface inspection by comparison methods, Direct measurement methods. Analysis of surface traces.	**14**
IV	**<u>Comparators And Measurement By Light Wave Interference:</u>** **4.1 Comparators :** Characteristics and uses of comparators, Working principle, advantages and disadvantages of various types of comparators– Mechanical comparators, optical comparators, Electrical comparators, pneumatic comparators, Fluid displacement comparators, optical Projectors. **4.2 Measurement by light wave interference:** Interferometry, interference of two rays, light source for interferometry, interferometry applied to flatness testing, Interferometers. **4.3 Testing and Calibration of Gauges:** - Calibration of linear and angular measuring instruments – General metrological instrument, optical measuring instruments, Measurement of limit gauges.	**14**

V	**<u>Measuring Machines and Recent Trends In Metrology:</u>** **5.1 Measuring Machines:** Optical profile projector – working principle, use, precaution in use. Coordinate Measuring Machine – Types, uses, advantages, possible source of error in CMM. Electronic Inspection and measuring machines. **5.2 Trends in Metrology:** Laser Telemetric system, Feeler microscope, Isometric viewing of surface defects. optoelectronic dimensional gauging, computers in metrology, Computer Aided dimensional analysis and reporting system, In process probing, contact less 3D measurements by Laser based system.	**14**
	TEST & REVISION	**05**

Text Books:

1. R.K.Jain., Engineering Metrology, Khanna Publishers, Eleventh edition,1989.

2. R.Jenkins, Fundamentals of Mechanical Inspection, McGraw Hill Book company.

Reference books :

1. ASTME, Hand book of Industrial Metrology, Prentice Hall

2. A.J.T Scarr, Metrology and Precision Engineering, McGraw Hill Book company.

3. J.Johnson, Precision Measurement, Pitman publishers

4. R.L.Murty, Precision Engineering in Manufacturing, New Age International Publishers (P) limited,1995. 5. A.W.Judge, Engineering Precision Measurements, Chapman and Hall Publishers.

6. A.P.Miller, Engineering Dimensional Metrology, Arnold publishers.

7. W.Mollard, Essentials of Precision Inspection, McGraw Hill Book company.F.H.Rolt, Gauges and Fine Measurements, Macmillan book company.

8. P.C.Nakra & K.K.Chowdhry, Instruments, Measurements & Analysis.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

32234 – MACHINE & TOOL DRAWING

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32234
Semester : III
Subject Title : **MACHINE & TOOL DRAWING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: **15 Weeks**

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Machine & Tool Drawing	6	90	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Unit No	Topics	Hours
I	Sectional Views	3
II	Limits, Fits and Tolerances	6
III	Surface Texture	3
IV	Keys, Screw threads and Threaded fasteners	6
V	Drawing practice of sleeve & Cotter joint, Knuckle joint, Screw Jack, Foot step bearing, Universal Coupling, Plummer Block, Machine Vice, Protected type flanged coupling, Drill Jig, Welding Fixture, Press Tool Assembly- Blanking Tool, Plastic Mould Assembly- Injection Moulding Tool – Manual Drawing Practice	67
	TEST & REVISION	05
	Total	90

RATIONALE:

Manufacturing of various machine parts and production of various equipments in small scale to big scale industries start from the basic drawing of components. The assembly of components is also carried out from the drawing. So drawing is an important subject to be studied by supervisor cadre students to carry and complete the production and assembly process successfully.

The first three are theory units in which the students can comprehend the various types of sections used in drawing practice. Types of fits used, limits and tolerances of dimensions and surface finish methods which are to be used in industrial drawing will also be taught in these three units.

The fourth unit is also a theory unit in which the students can understand the types of fasteners and study of temporary fasteners like keys, screw threads and threaded fasteners which are commonly used in assembly process.

The final unit gives the practice of manual drawing of the commonly used components in industries to give a thorough knowledge of drawings.

The overall objective is to impart knowledge to the students so as to carry out the production and the assembly process without wastage of Man/Machine and Materials to have economical overall process.

OBJECTIVES:

- Appreciate the need for sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare hole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Appreciate the importance of fits and tolerance.

32234 – MACHINE & TOOL DRAWING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**SECTIONAL VIEWS** Review of sectioning – Conventions showing the section – symbolic representation of cutting plane- types of section – full section, half section, offset section, revolved section, broken section, removed section – section lining.	**3 Hrs**
II	**LIMITS, FITS AND TOLERANCES** Tolerances – Allowances – Unilateral and Bilateral tolerances. Limits – Methods of tolerances – Indication of tolerances on linear dimension of drawings – Geometrical tolerances – application – Fits – Classifications of fits – Selection of fits – examples	**6 Hrs**
III	**SURFACE TEXTURE** Surface texture – importance – controlled and uncontrolled surfaces – Roughness – Waviness – lay – Machining symbols	**3 Hrs**
IV	**KEYS, SCREW THREADS AND THREADED FASTENERS** Types of fasteners – temporary fasteners – keys – classification of keys – Heavy duty keys – light duty keys. Screw thread – Nomenclature – different types of thread profiles – threads in sections – threaded fasteners – bolts – nuts – through bolt – tap bolt, stud bolt – set screw – cap screws – machine screws – foundation bolts	**6 Hrs**
V	**MANUAL DRAWING PRACTICE** Detailed drawings of following machine parts are given to students to assemble and draw the sectional or plain elevations / plans / and side views with dimensioning and bill of materials. **Machine Drawing** 1. Sleeve & Cotter joint 2. Knuckle joint 3. Screw Jack 4. Foot step bearing 5. Universal Coupling 6. Plummer Block 7. Machine Vice 8. Protected type flanged coupling **Tool Drawing** 9. Drill Jig 10. Welding Fixture 11. Press tool Assembly - Blanking tool 12. Plastic Moulding tool assembly – Injection moulding tool	**52 Hrs**
	TEST & REVISION	05

Reference Books:

1) Machine Drawing, P.S. Gill, Katsan Publishing House, Ludiana

2) A Text book of Engineering Drawing, R.B. Gupta, Satya Prakasan, Technical India Publications, NewDelhi

3) Mechanical Draughtsmanship, G.L. Tamta, Dhanpat Rai & Sons, Delhi

4) Geometrical and Machine Drawing, N.D. Bhatt, Cheroter book stalls, Anand, West Railway

5) Engineering Drawing, D.N. Ghose, Dhanpat Rai & Sons, Delhi

Board Examination - Question Paper Pattern

Time: 3 Hrs **Max Marks : 75**

Note: All the questions will be answered in drawing sheet only

PART A (6 x 5 = 30)

Theory questions:

- ✓ Two questions from each unit (I to IV) will be asked.
- ✓ Answer any six questions from the given eight questions.

PART B : 45 Marks

(Either Machine Drawing or Tool Drawing.)

Answer any one question by selecting either A or B.

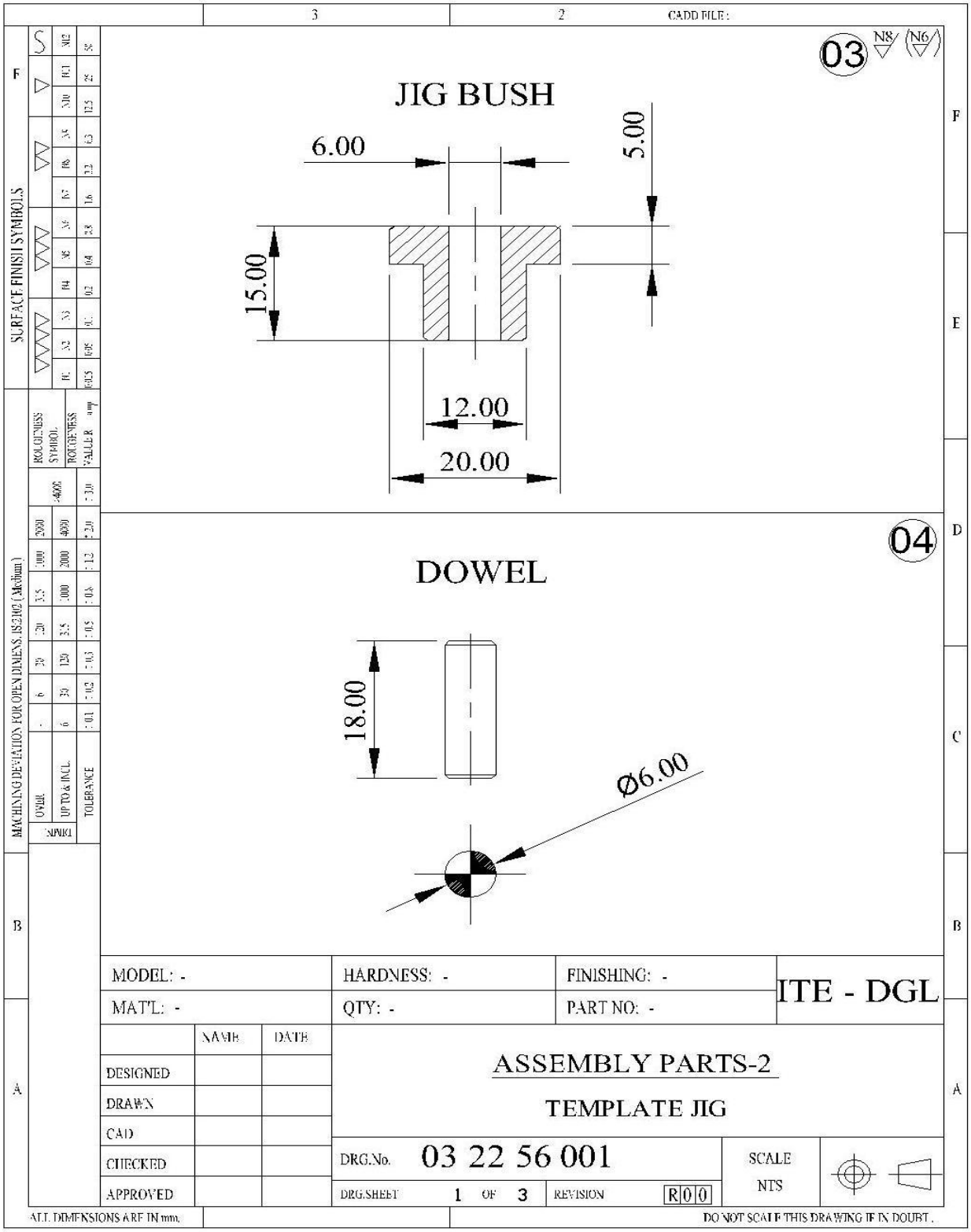
A. Assemble and Draw any two views and bill of materials.(from machine or tool drawing)

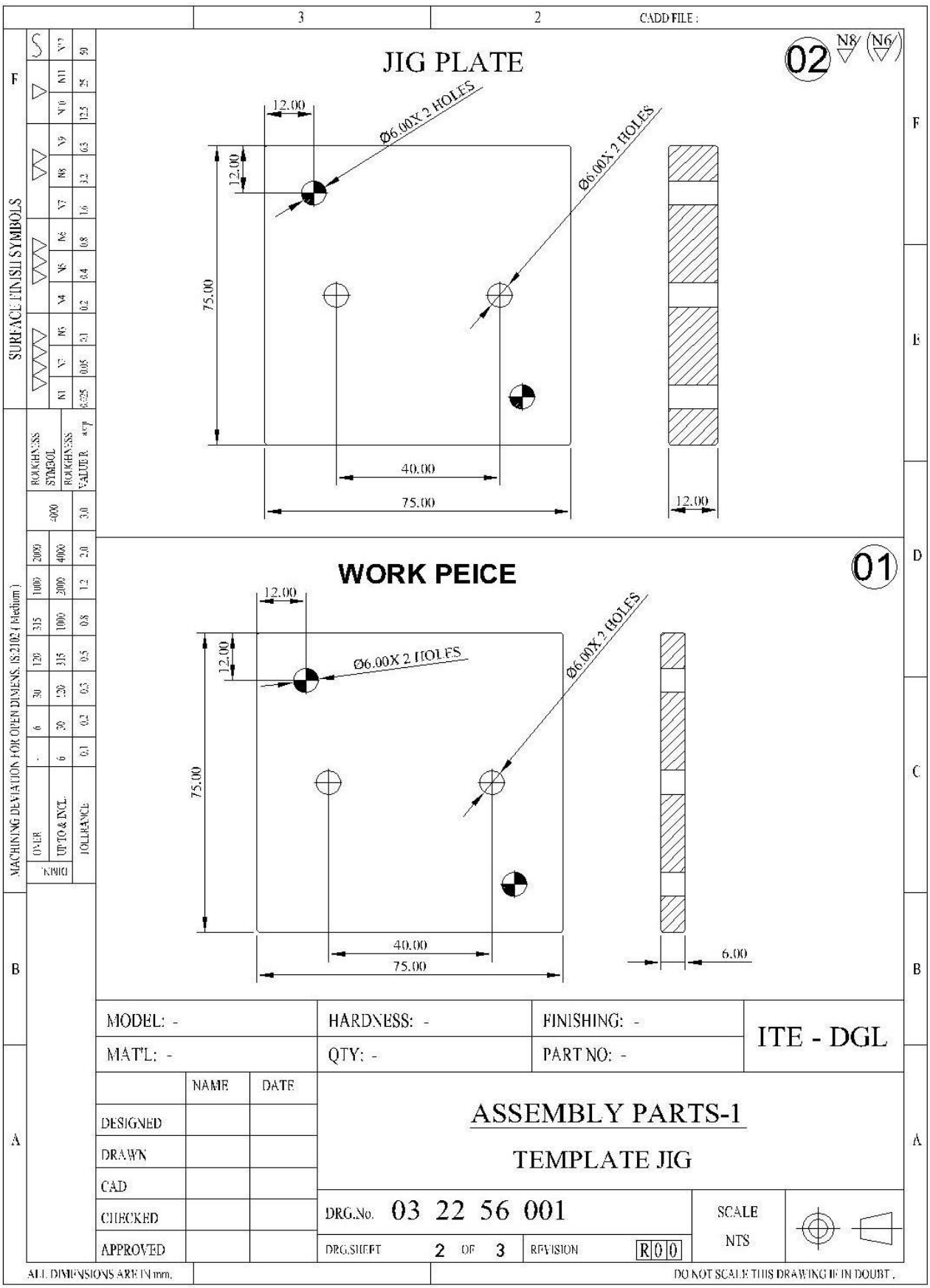
(OR)

B. Assemble and Draw any two views and bill of materials. (from machine or tool drawing)

Tool Drawing

Exercise – 9 Template Jig




JIG PLATE
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(N6)
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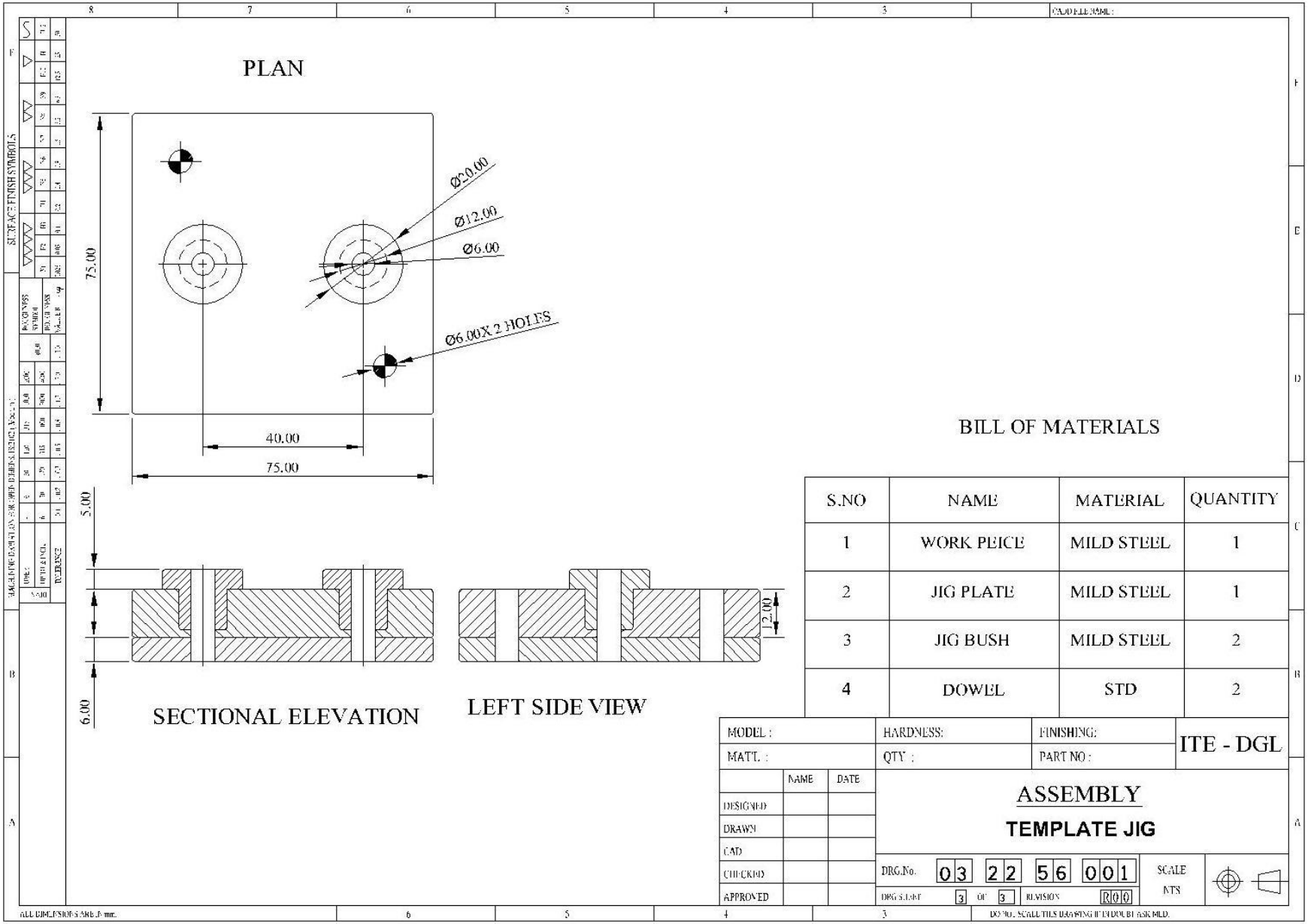
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
ITE - DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
TEMPLATE JIG
DRG.No. 03 22 56 001
SCALE
NTS
DRG.SHEET 2 OF 3
REVISION R 0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.



BILL OF MATERIALS

S.NO	NAME	MATERIAL	QUANTITY
1	WORK PEICE	MILD STEEL	1
2	JIG PLATE	MILD STEEL	1
3	JIG BUSH	MILD STEEL	2
4	DOWEL	STD	2

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

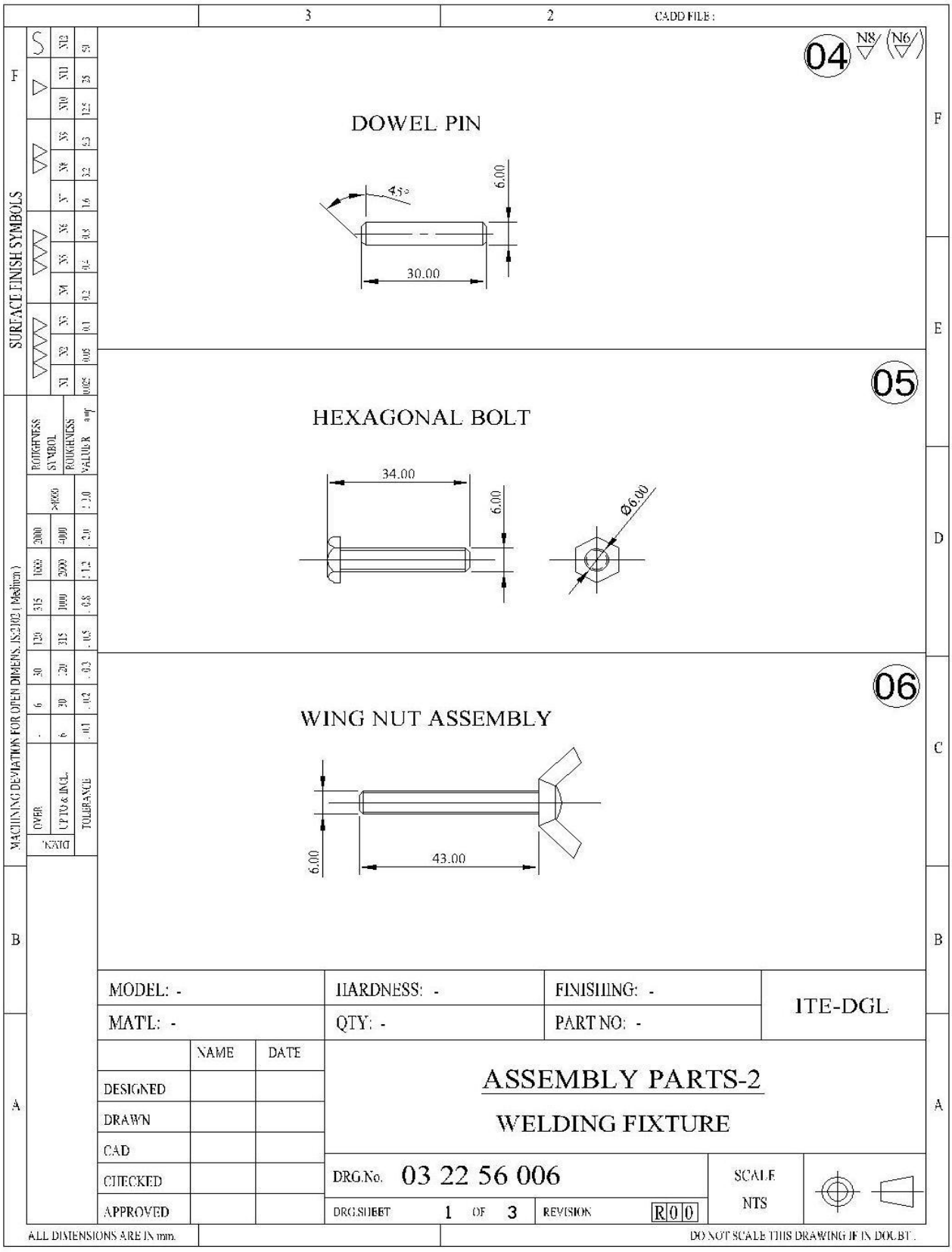
ASSEMBLY

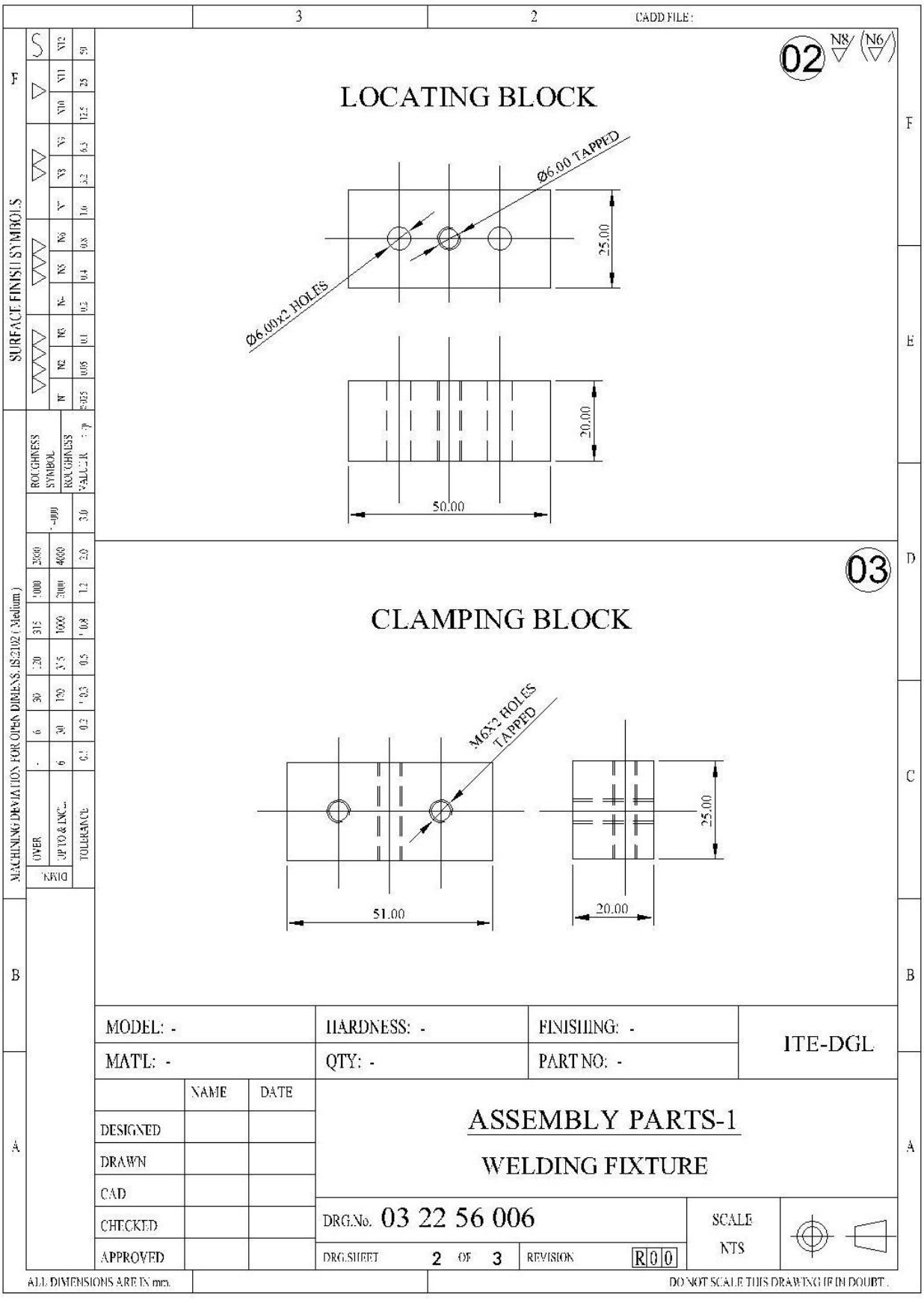
TEMPLATE JIG

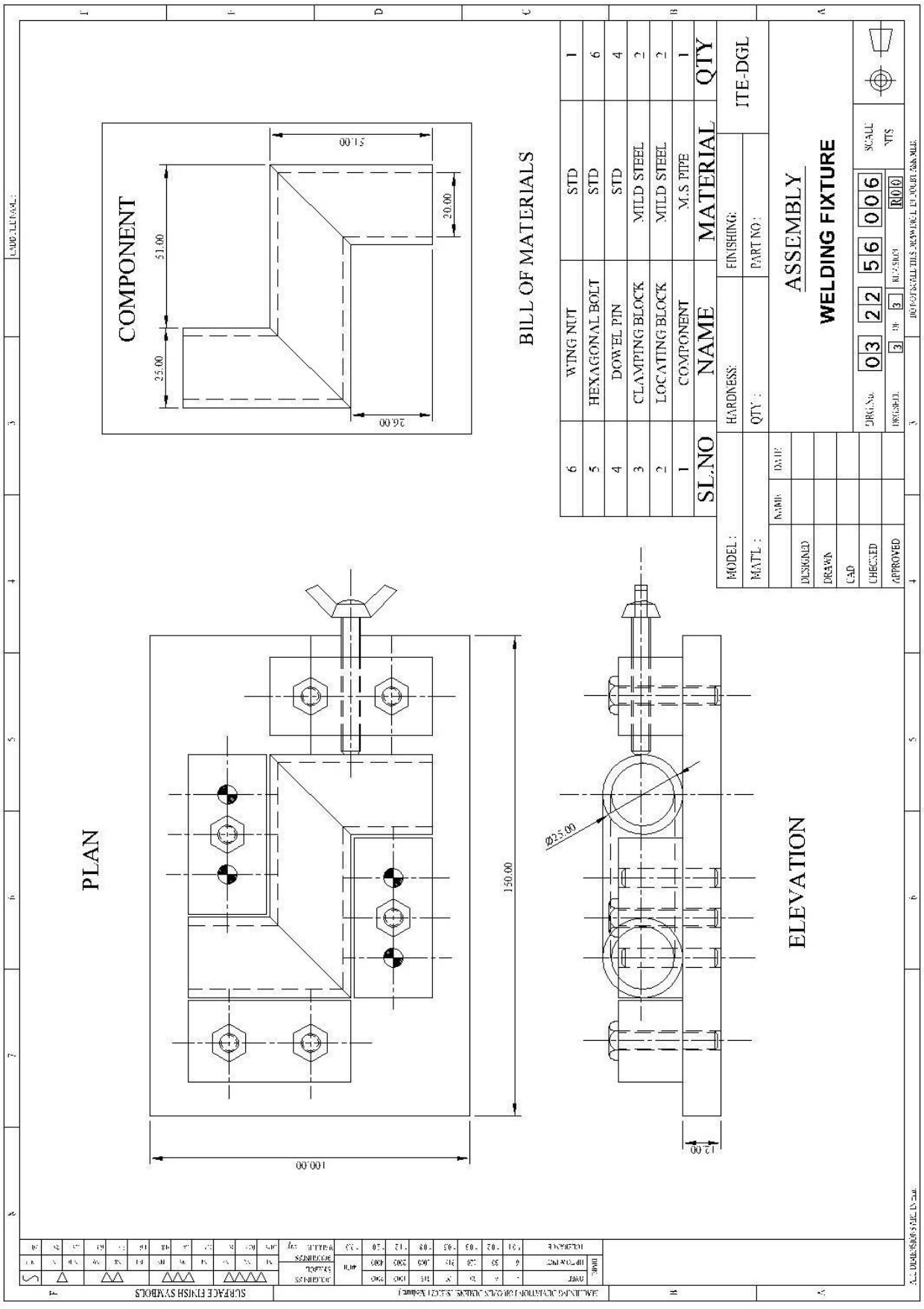
DRG.No. 03 22 56 001 | SCALE NTS | DRG SHEET 3 OF 3 | REVISION R00

ALL DIMENSIONS ARE IN mm. | DO NOT SCALE THIS DRAWING IF IN DOUBT ASK MED.

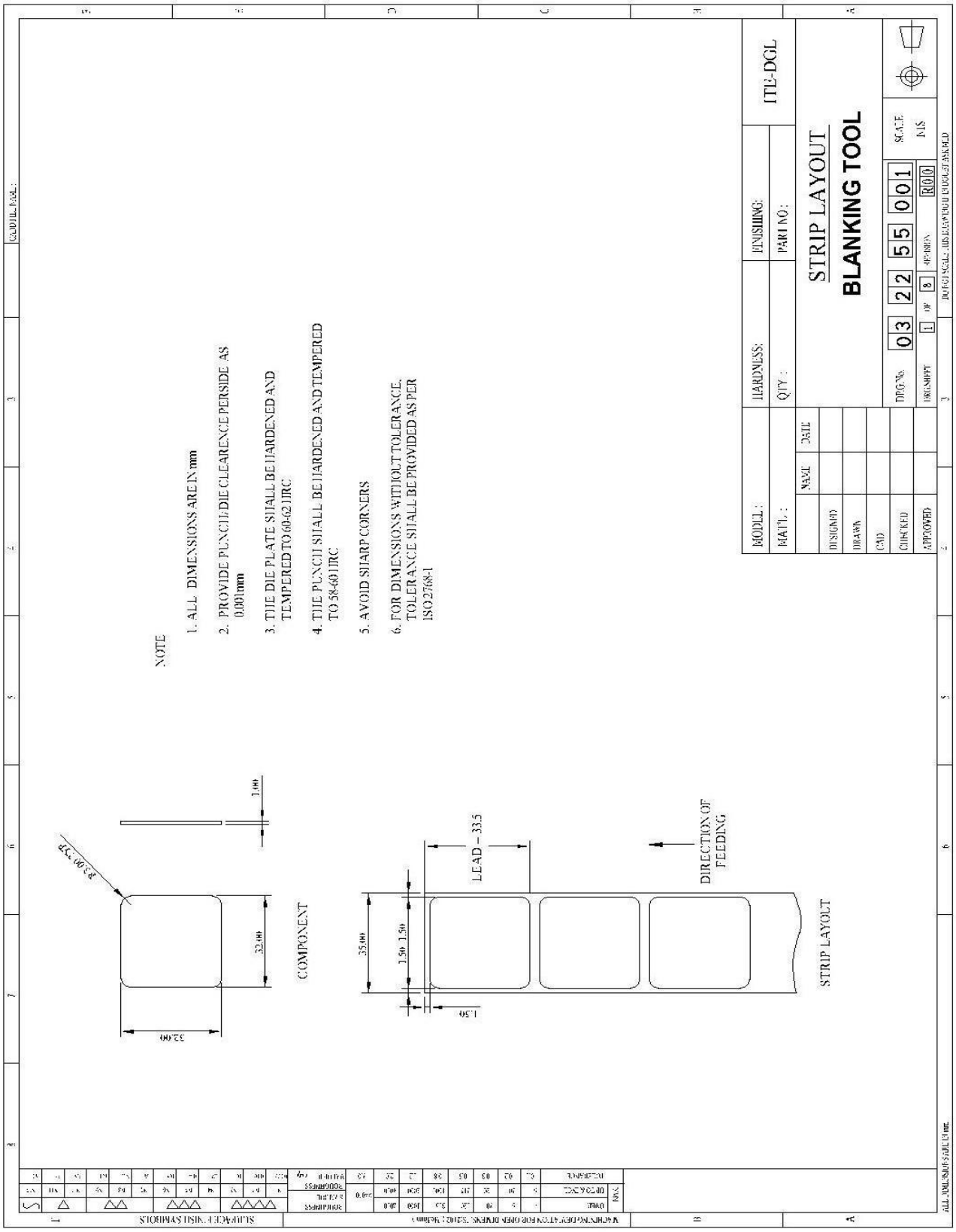
Exercise –10 Welding Fixture

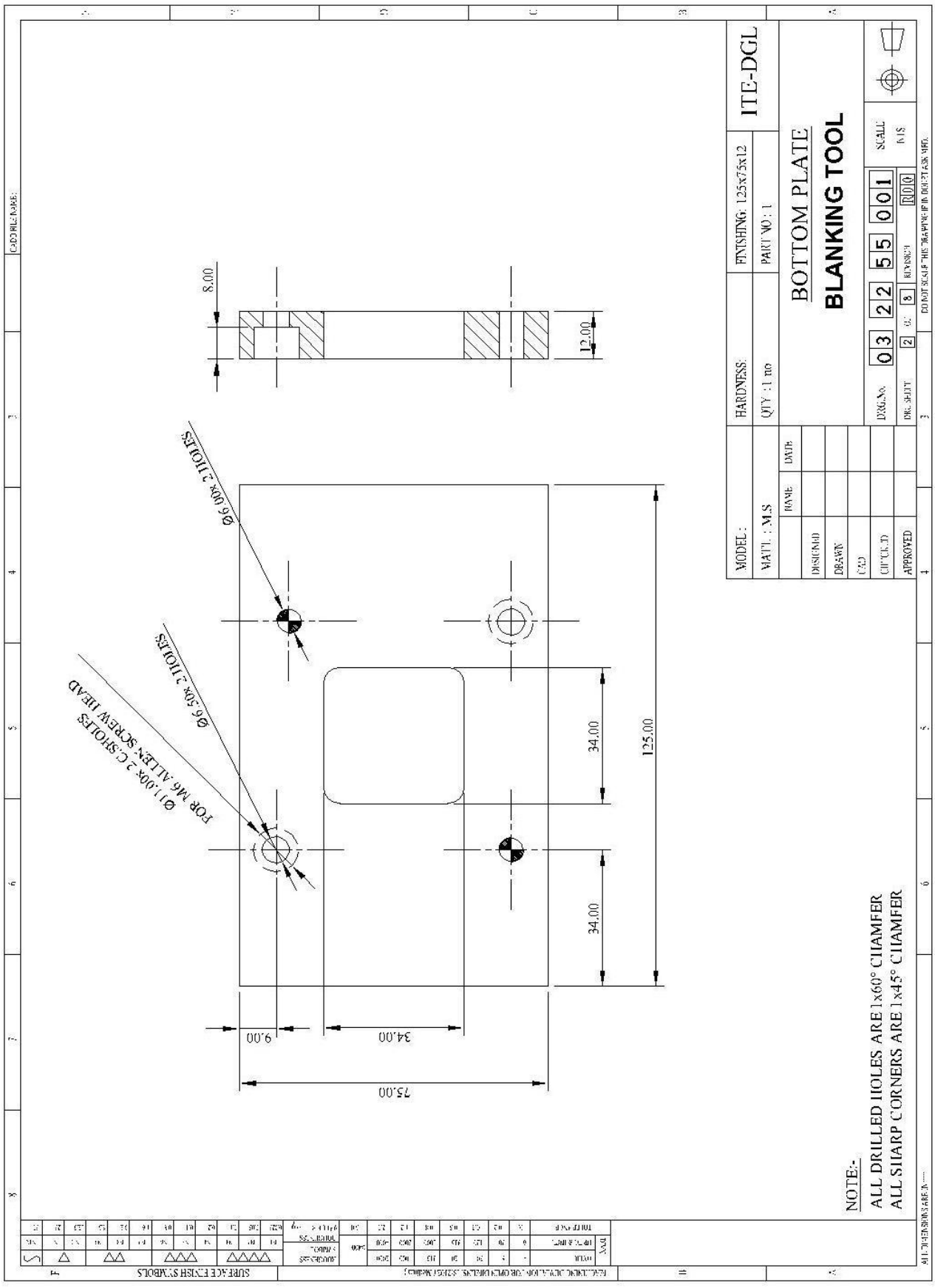


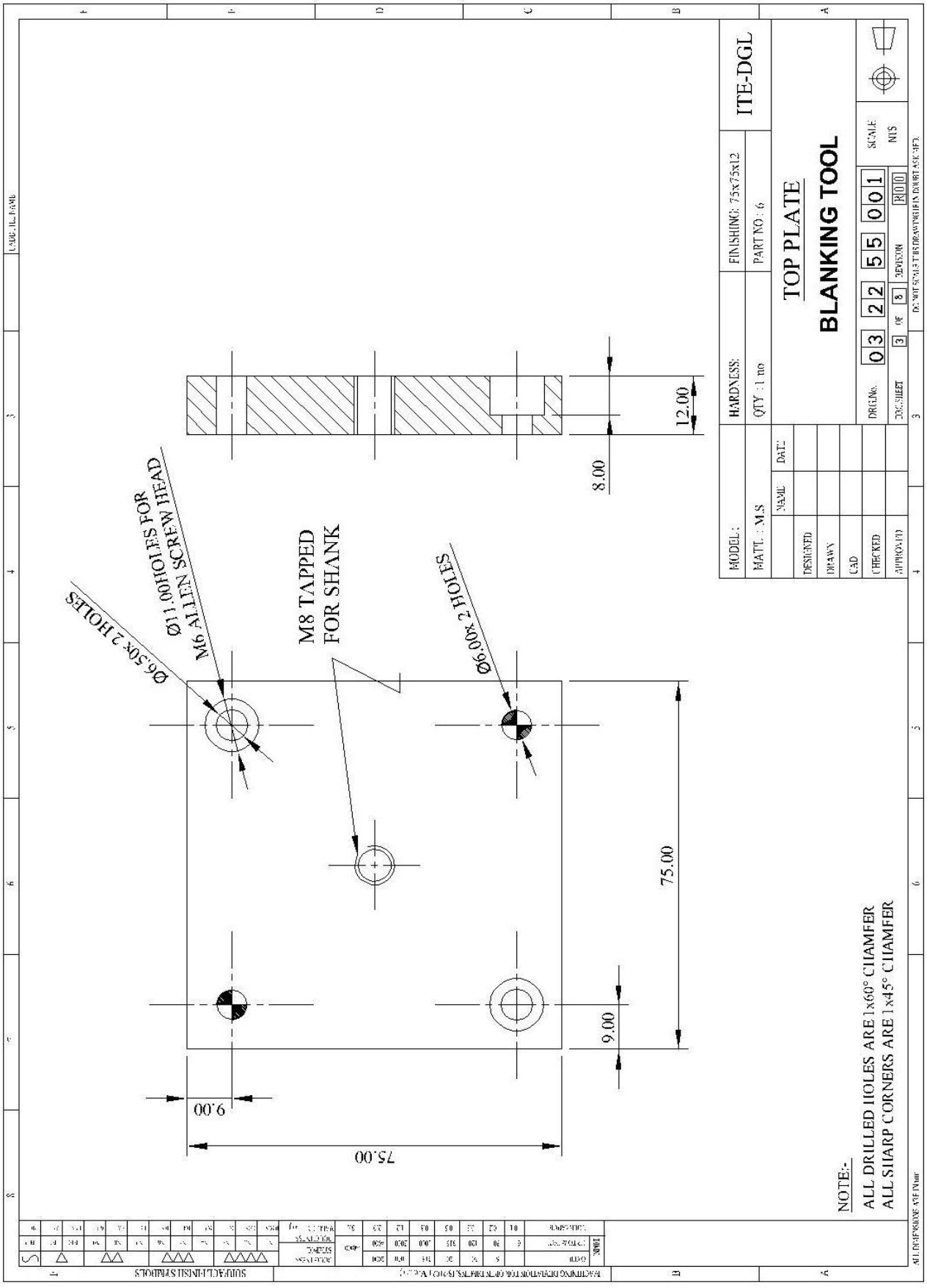

CADD FILE :
02
LOCATING BLOCK
Ø6.00 TAPPED
Ø6.00x2 HOLES
25.00
20.00
50.00
03
CLAMPING BLOCK
M6X2 HOLES TAPPED
25.00
51.00
20.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. (IS:2102 (Medium)
ROUGHNESS SYMBOL
TOLERANCE
MODEL: -
HARDNESS: -
FINISHING: -
ITE-DGL
MATL: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
WELDING FIXTURE
DRG.No. 03 22 56 006
SCALE NTS
DRG.SHEET 2 OF 3
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

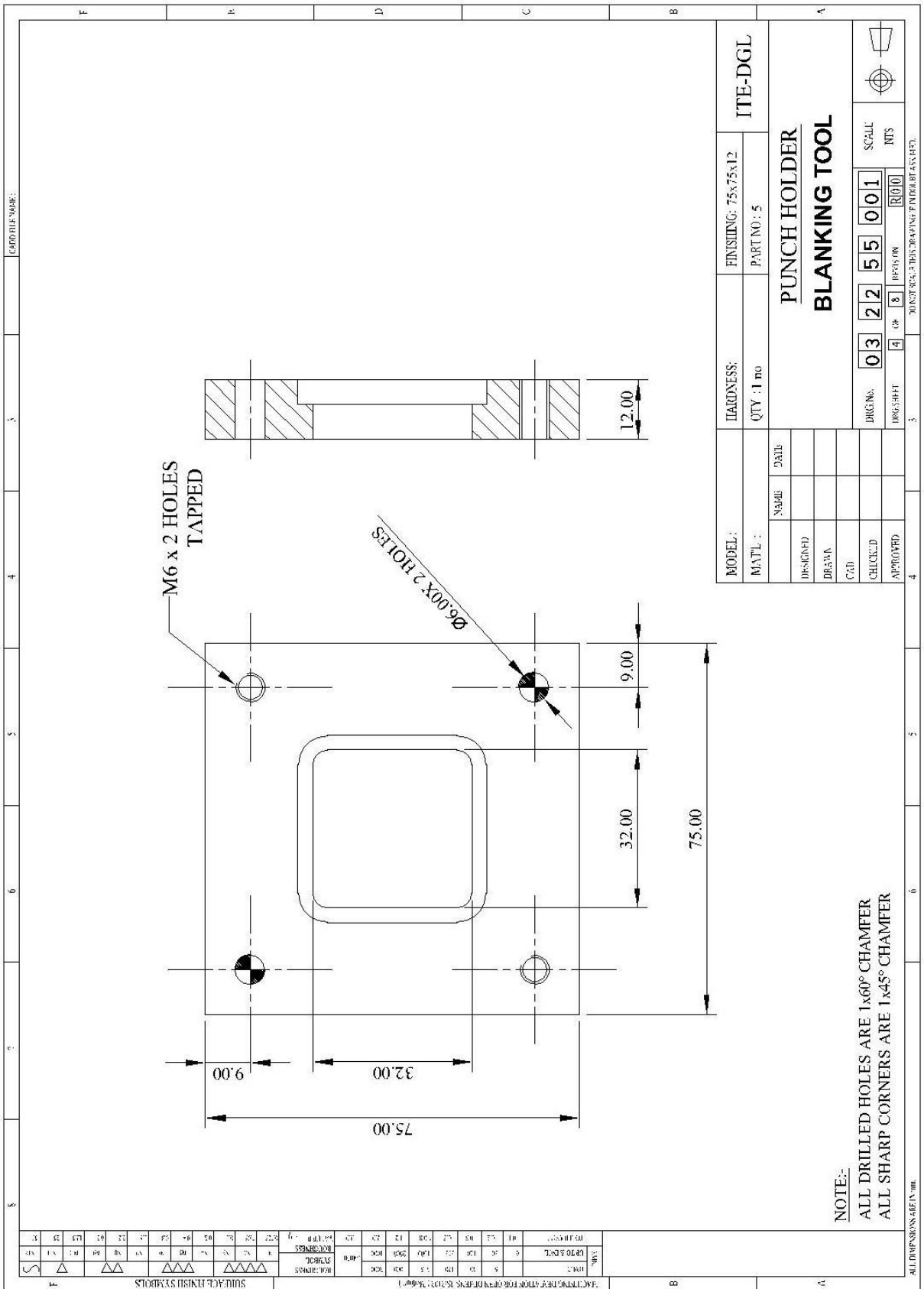

ASSEMBLY
WELDING FIXTURE
ITE-DGL
DRG.No 03 22 56 006
SCALE NTS
COMPONENT
51.00
25.00
26.00
20.00
BILL OF MATERIALS
SL.NO
NAME
MATERIAL
QTY
1 COMPONENT M.S PIPE 1
2 LOCATING BLOCK MILD STEEL 2
3 CLAMPING BLOCK MILD STEEL 2
4 DOWEL PIN STD 4
5 HEXAGONAL BOLT STD 6
6 WING NUT STD 1
PLAN
ELEVATION
100.00
150.00
Ø25.00
12.00

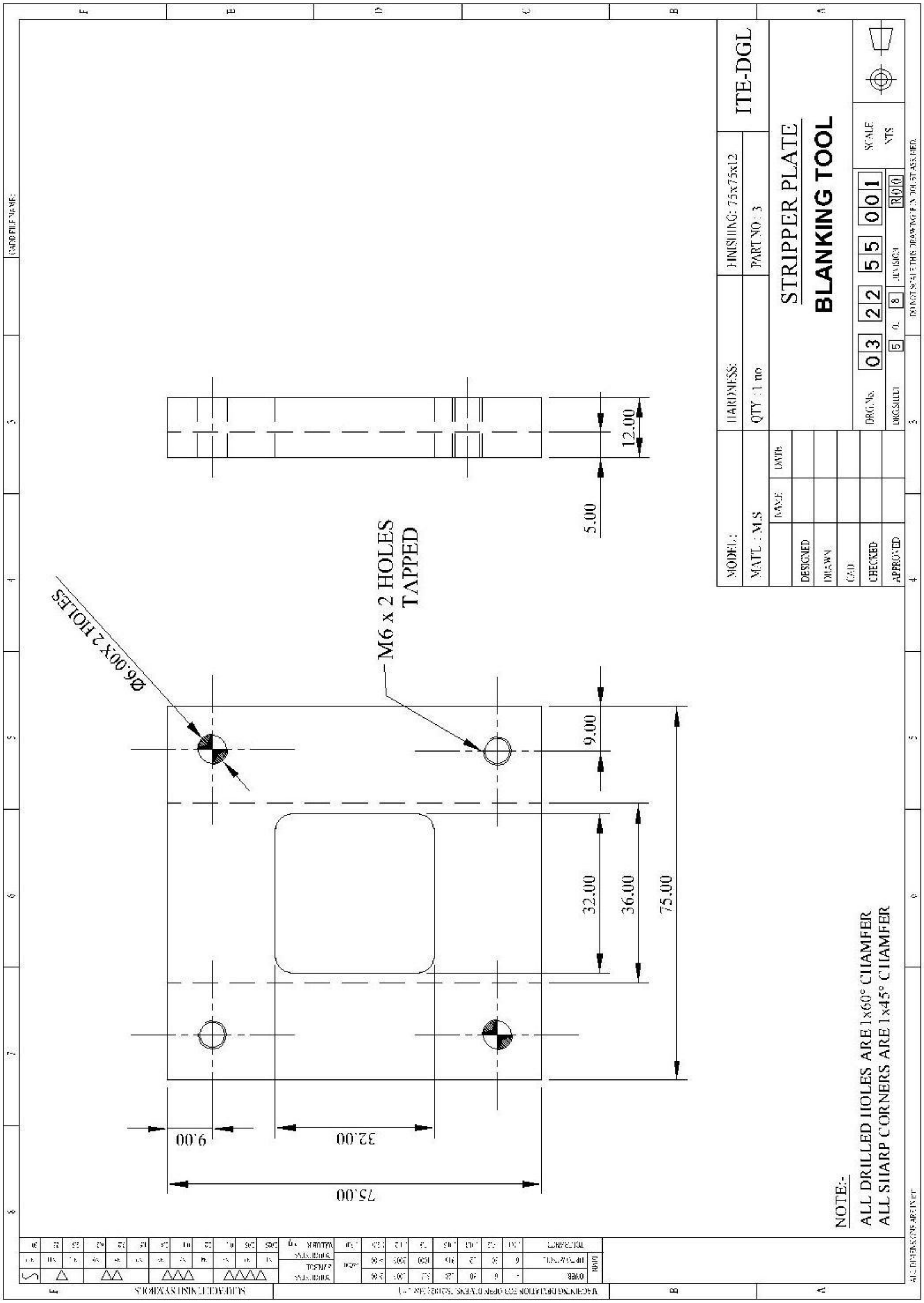
Exercise- 11 Blanking Tool – Drop through type

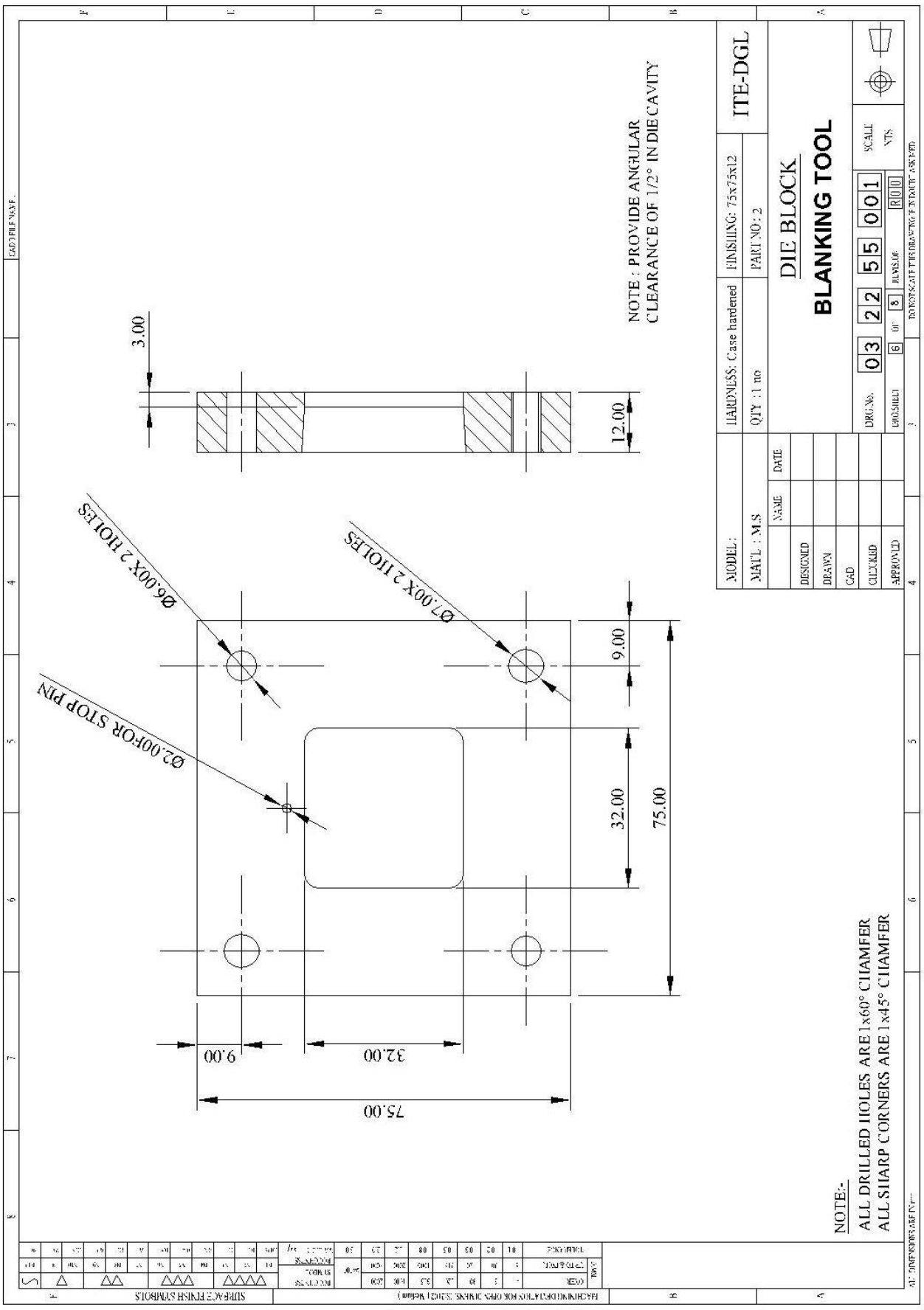


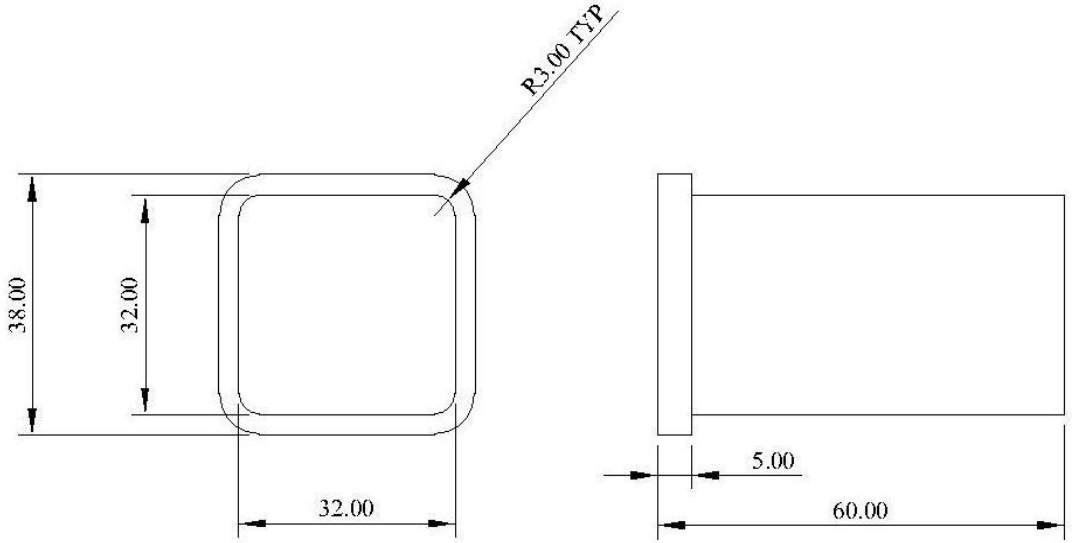

8.00
12.00
Ø9.00x 2 HOLES
Ø6.50x 2 HOLES
Ø11.00x 2 C'SHOLES
FOR M6 ALLEN SCREW HEAD
34.00
125.00
34.00
9.00
34.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 125x75x12
PART NO : 1
ITE-DGL
BOTTOM PLATE
BLANKING TOOL
DRG.No 03 22 55 001
SCALE 1:1
DRG. SHEET 2
R000
DO NOT SCALE THIS DRAWING
DESIGNED
DRAWN
CHECKED
APPROVED
NAME
DATE


TOP PLATE
BLANKING TOOL
ITE-DGL
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 75x75x12
PART NO : 6
DRG No. 03 22 55 001
SCALE NTS
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
NAME
DATE
Ø11.00HOLES FOR M6 ALLEN SCREW HEAD
M8 TAPPED FOR SHANK
Ø6.00x 2 HOLES
Ø6.50x 2 HOLES
12.00
8.00
75.00
9.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


M6 x 2 HOLES
TAPPED
Ø6.00X 2 HOLES
12.00
9.00
32.00
75.00
9.00
32.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
PUNCH HOLDER
BLANKING TOOL
ITE-DGL
FINISHING: 75x75x12
PART NO : 5
QTY : 1 no
HARDNESS:
MODEL :
MATL :
DRG NO. 03 22 55 001
SCALE NTS


ITE-DGL
FINISHING: 75x75x12
PART NO: 3
HARDNESS:
QTY: 1 no
MODEL:
MAT'L: M.S
STRIPPER PLATE
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE NTS
DESIGNED
DRAWN
CHECKED
APPROVED
M6 x 2 HOLES TAPPED
Ø6.00X 2 HOLES
5.00
12.00
9.00
32.00
36.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

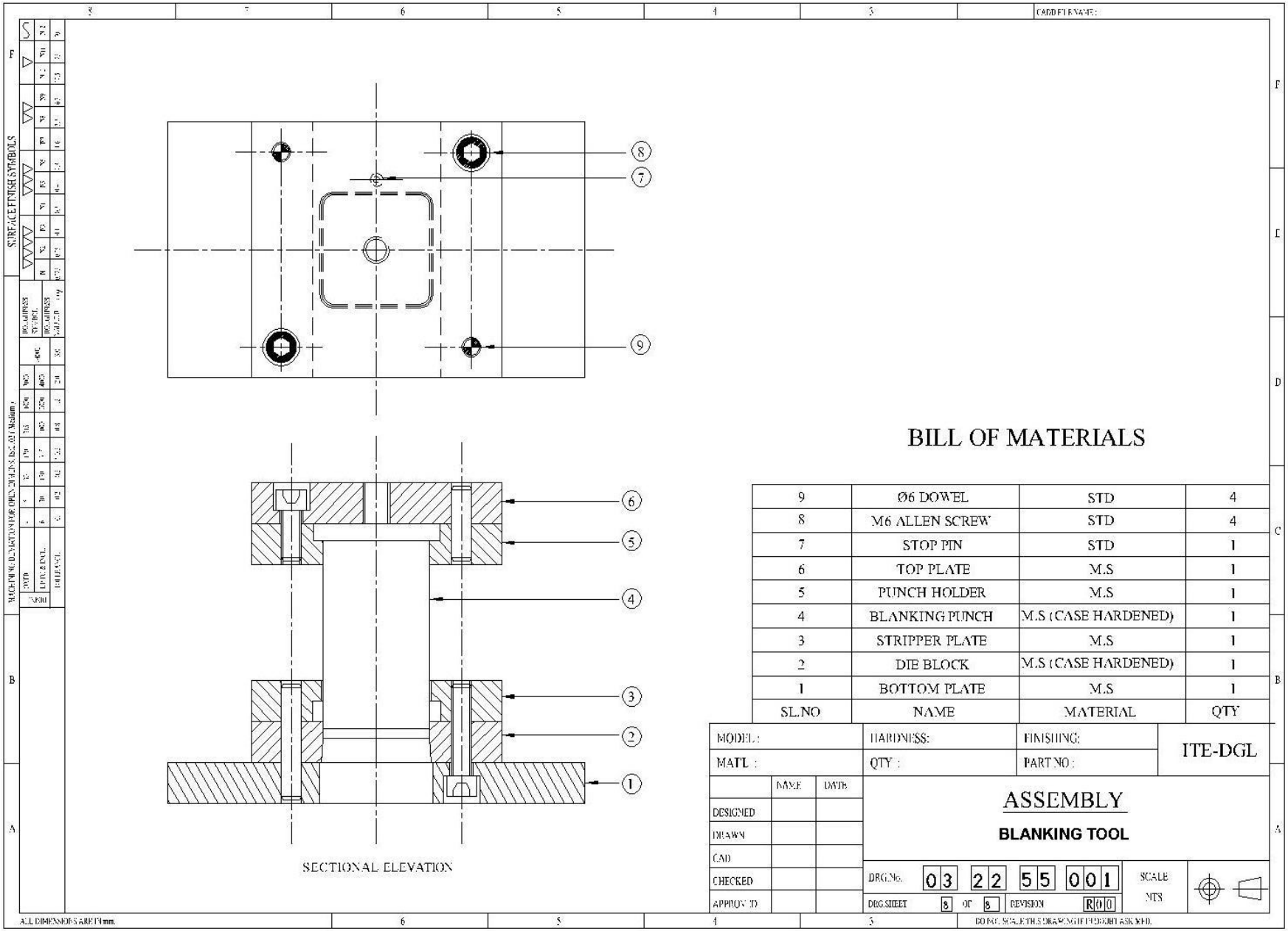

NOTE : PROVIDE ANGULAR
CLEARANCE OF 1/2° IN DIE CAVITY
3.00
12.00
Ø7.00X 2 HOLES
Ø6.00X 2 HOLES
Ø2.00FOR STOP PIN
9.00
32.00
75.00
9.00
32.00
75.00
MODEL :
MAT'L : M.S
HARDNESS: Case hardened
QTY : 1 no
FINISHING: 75x75x12
PART NO : 2
ITE-DGL
DIE BLOCK
BLANKING TOOL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DRG.No. 03 22 55 001
SCALE NTS
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL :		HARDNESS: Case hardened	FINISHING: 38x38x60	ITE-DGL
MATL : M.S		QTY :1 no	PART NO : 4	
	NAME	DATE	PUNCH	
DESIGNED			BLANKING TOOL	
DRAWN				
CAD				
CHECKED			DRG.No. 03 22 55 001	SCALE NTS
APPROVED			DRG.SHEET 7 OF 8	REVISION R0 0



BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
9	Ø6 DOWEL	STD	4
8	M6 ALLEN SCREW	STD	4
7	STOP PIN	STD	1
6	TOP PLATE	M.S	1
5	PUNCH HOLDER	M.S	1
4	BLANKING PUNCH	M.S (CASE HARDENED)	1
3	STRIPPER PLATE	M.S	1
2	DIE BLOCK	M.S (CASE HARDENED)	1
1	BOTTOM PLATE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

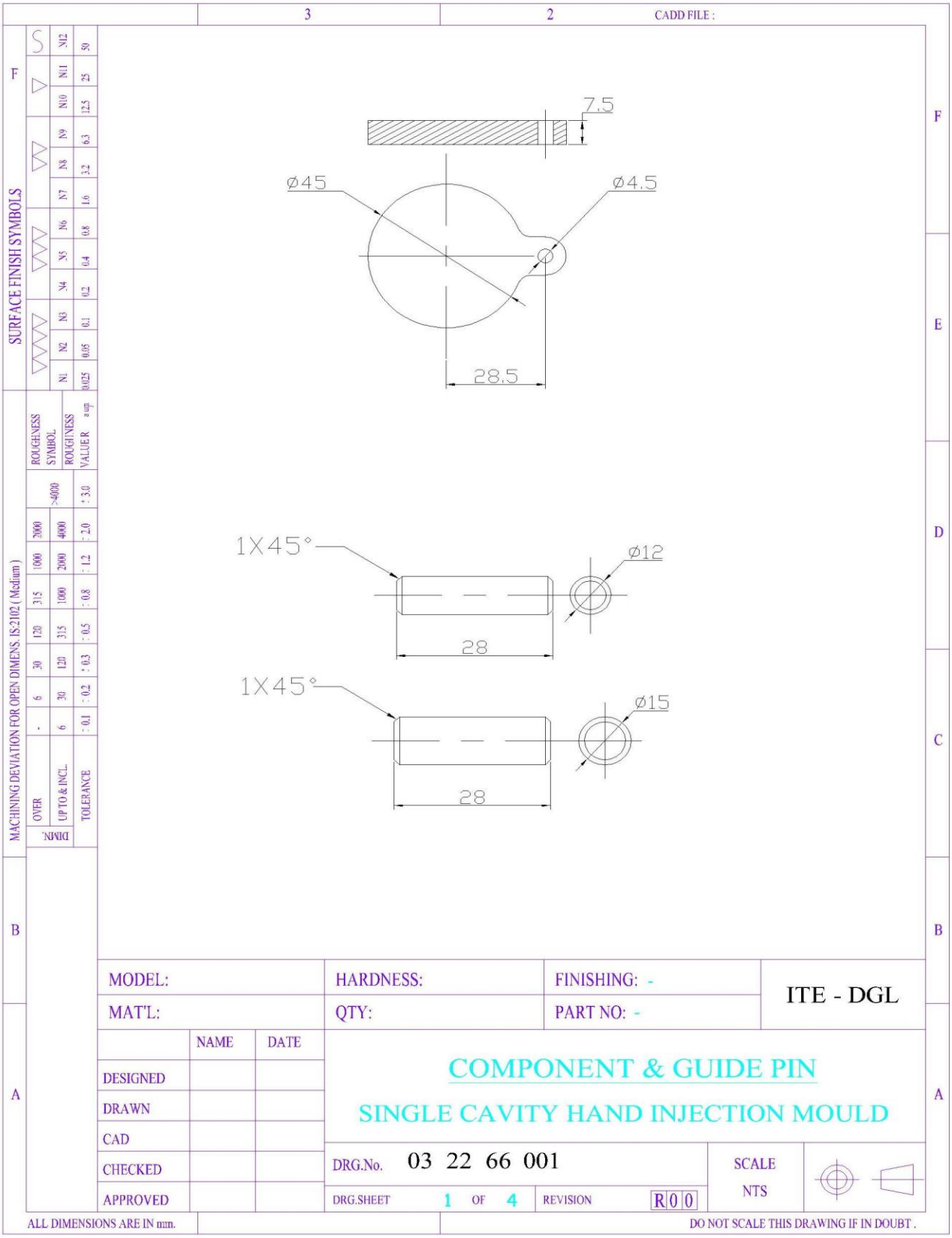
ASSEMBLY

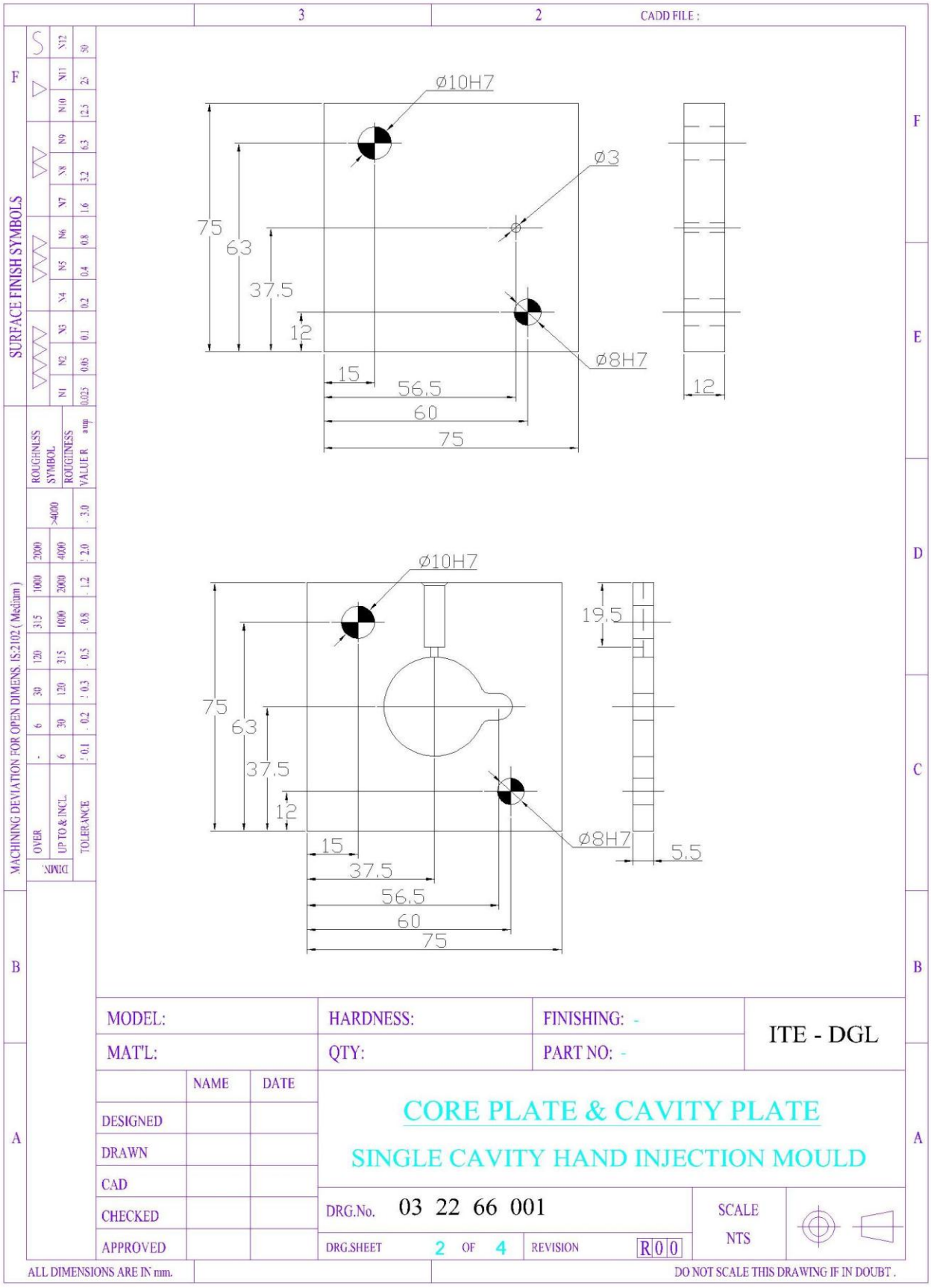
BLANKING TOOL

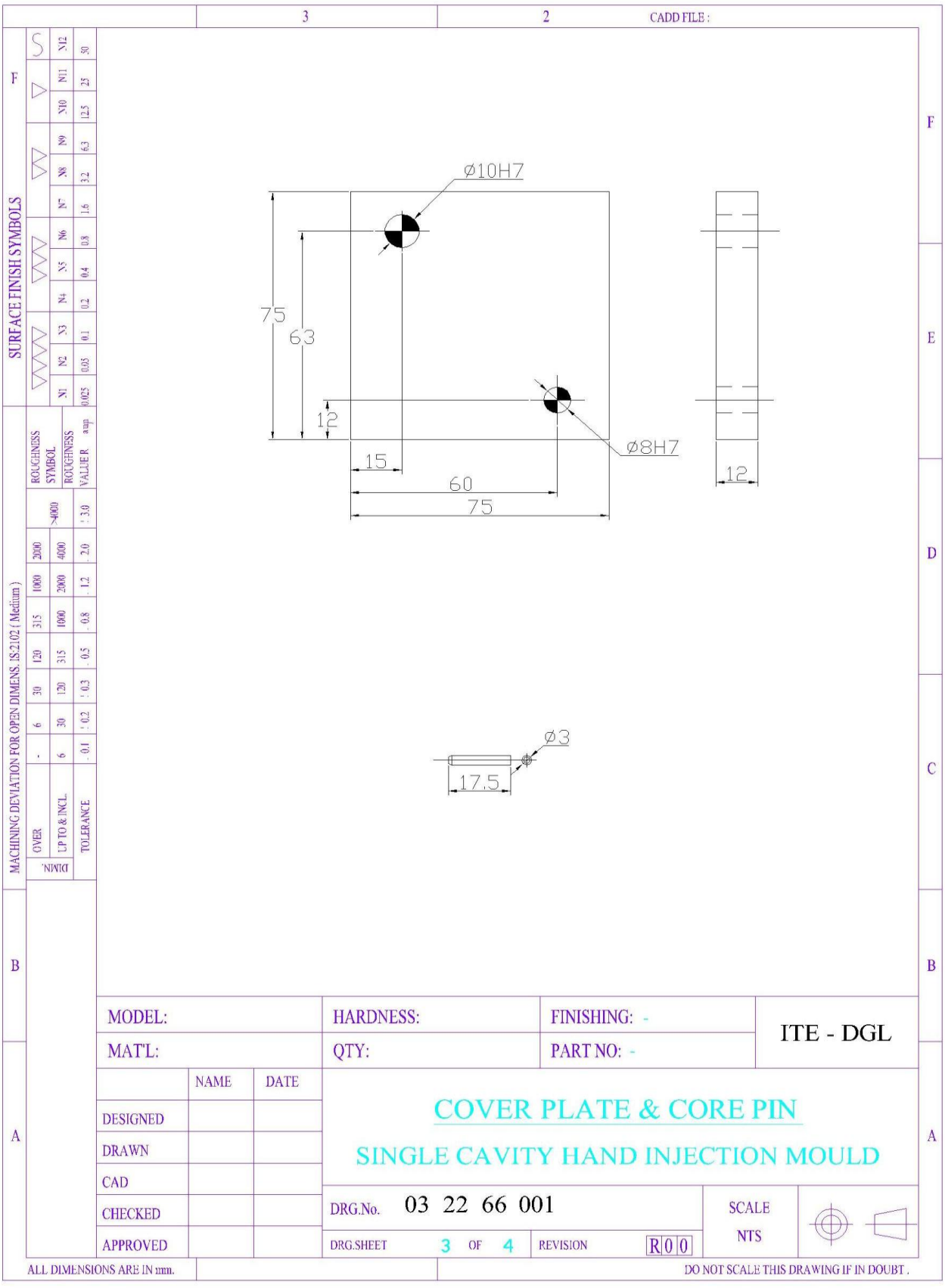
DRG.No. 03 22 55 001 | SCALE NTS | DRG.SHEET 8 OF 8 | REVISION R0 0

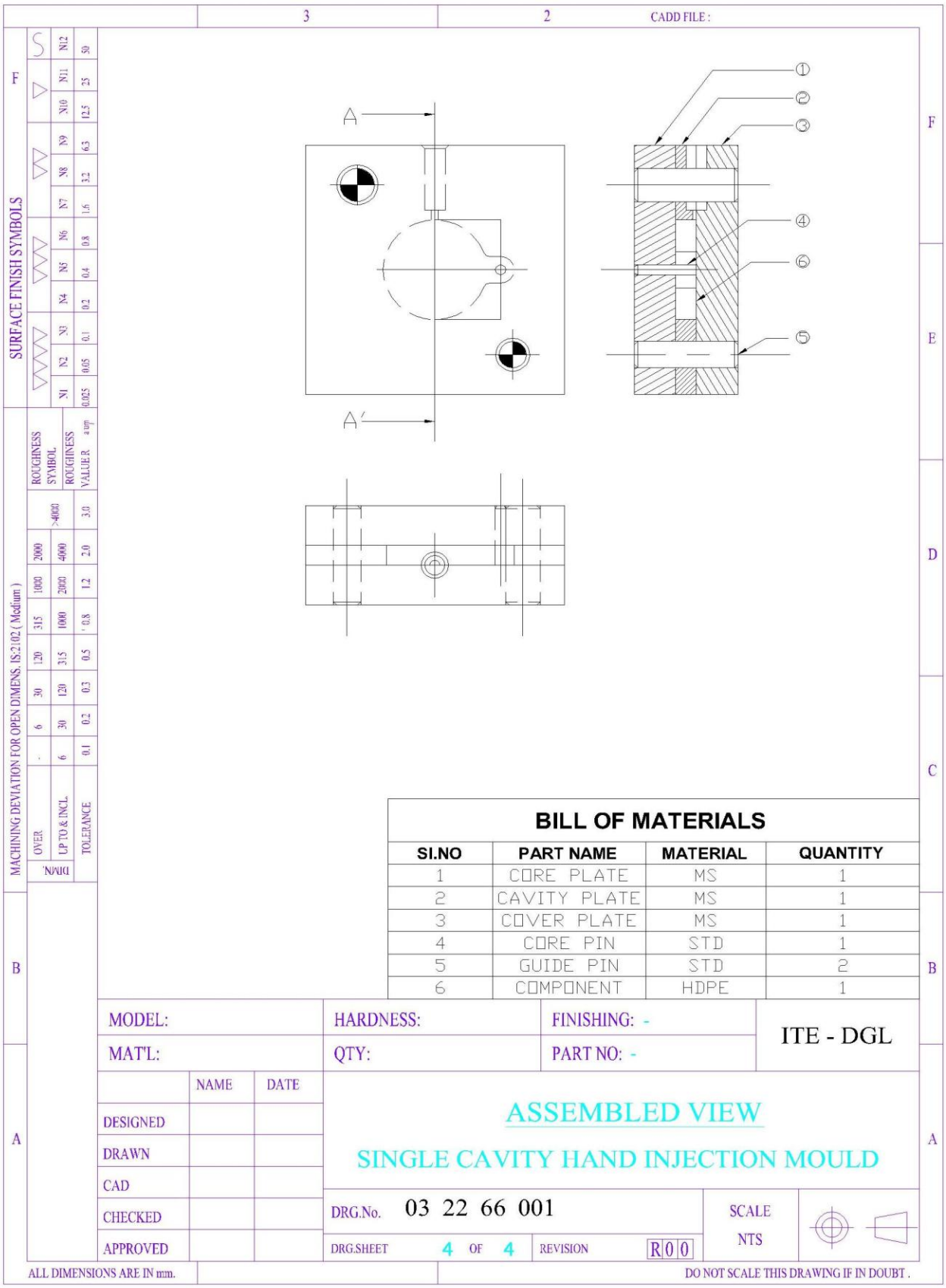
ALL DIMENSIONS ARE IN mm.

Exercise –12 Single Cavity Injection Mould




3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
Ø10H7
Ø3
Ø8H7
75
63
37.5
12
15
56.5
60
75
12
19.5
5.5
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
CORE PLATE & CAVITY PLATE
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
SCALE NTS
DRG.SHEET 2 OF 4
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


3
2
CADD FILE :
SURFACE FINISH SYMBOLS
N12 50
N11 25
N10 12.5
N9 6.3
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a µm
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
DIMN.
OVER
UP TO & INCL.
TOLERANCE
- 6 0.1
6 30 0.2
30 120 0.3
120 315 0.5
315 1000 0.8
1000 2000 1.2
2000 4000 2.0
4000 3.0
ø10H7
75
63
12
15
60
75
ø8H7
12
ø3
17.5
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
COVER PLATE & CORE PIN
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
SCALE NTS
DRG.SHEET 3 OF 4
REVISION R 0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


3
2
CADD FILE :
SURFACE FINISH SYMBOLS
N12 50
N11 25
N10 12.5
N9 6.3
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a μm
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Modium)
DIMN.
OVER
UP TO & INCL.
TOLERANCE
A
A'
①
②
③
④
⑥
⑤
BILL OF MATERIALS
SI.NO | PART NAME | MATERIAL | QUANTITY
1 | CORE PLATE | MS | 1
2 | CAVITY PLATE | MS | 1
3 | COVER PLATE | MS | 1
4 | CORE PIN | STD | 1
5 | GUIDE PIN | STD | 2
6 | COMPONENT | HDPE | 1
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLED VIEW
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
DRG.SHEET 4 OF 4
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

32235 – ENGINEERING METROLOGY PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name **:** DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code **:** 32235
Semester **:** III
Subject Title **:** **ENGINEERING METROLOGY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: **15 Weeks**

Subject	Instructions		Examination			
			Marks			Duration (Hrs)
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
Engineering Metrology Practical	3	45	25	75	100	3

OBJECTIVES

- To practice linear and angular measurements
- To Use vernier caliper, vernier height gauge and micrometer
- To Use slip gauges to make standard dimensions
- To Measure angle of surface using sine bar
- To Use dial indicator to measure geometrical parameters
- To Demonstrate parallelism, squareness and circularity
- To Check the perpendicularity and squareness of a surface
- To Calibrate vernier caliper and micrometer using slip gauges

32235 - ENGINEERING METROLOGY PRACTICAL

Detailed Syllabus

I. LINEAR MEASUREMENT:

1(a). Vernier caliper – Measuring the overall dimensions of a Die plate to an accuracy of 0.02 mm.

1(b). Micrometer – Measuring diameter and thickness of die components to an accuracy of one micron (0.001mm)

2(i). Vernier height gauge:- a) Measurement of height of the given work piece
b) Marking the given dimensions on the work piece.
c) Transferring measurements from one job to another.

2(ii). Vernier Depth gauge – Measuring the depth of blind holes in the give work piece.

3(a). Screw thread micrometer – Measuring the root dia of the given screw thread

3(b). Measurement of pitch of screw threads using screw pitch gauges.

3(c). Measurement of effective dia of screw thread using three wire method.

4. Measurement of Internal dia of the given die set bush using Inside Micrometer to an accuracy of one micron.

5. Slip Gauges – Building up the given required dimensions and measuring or marking or setting Go and No Go sizes in adjustable gap gauges, to an accuracy of 0.5 micron.

6. Measuring the chordal thickness of the gear teeth using the gear tooth vernier.

II. ANGULAR MEASUREMENT:

7. Measurement of angles using universal bevel protractor to an accuracy of 5'.

8. Using combination set i) Measure angle in the given component with protractor head
ii) Find or mark the center of the given cylindrical job using center head.
iii) Check and report the squareness of the given specimen using square head.

9. Measure the angle of the surface using Sine bar and Slip Gauges.

III. MEASUREMENT OF GEOMETRIC PARAMETERS AND CALIBRATION OF INSTRUMENTS:

10. Straightness – Measurement of concavity / convexity in a surface using Toolmaker's straight edge and feeler gauge.

11. Checking the parallelism of two planes using dial indicator.

12. Testing circularity of die set pillars using v-block and dial indicators.

13. Measurement of Run-out on i) External cylindrical surface
ii) external conical surface using dial gauge
iii) Checking of Perpendicularity of drill head guide
iv) Checking of squareness of clamping surface of table to its axis.

14. Measurement of axial slip using dial indicators.
15. Calibration and adjusting of micrometers/ Vernier caliper using slip gauges

SCHEME OF EXAMINATION:

	Duration	Max. Marks
I) Part – A		
a) Linear Measurement		
or	1 ½ Hrs.	35
b) Angular Measurement		
II) Part – B		
c) Measurement of Geometrical Parameters & calibration.	1 ½ Hrs.	35
III) Viva – Voce		05
	Total	75

SCHEME OF VALUATION:

Observation / Reading	-	10 marks
Tabulation / Formula	-	10 marks
Calculation & Result	-	15 marks

DETAILS OF THE EQUIPMENTS

NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	SECOND
SEMESTER	III
NAME OF THE LABORATORY	32235 ENGINEERING METROLOGY PRACTICAL

S.NO	LIST OF THE EQUIPMENTS	QUANTITY REQUIRED
1	Vernier caliper 0-150mm	6
2	Micrometer 0-25mm	6
3	Vernier height gauge 0-300mm	2
4	Vernier depth gauge 150mm	2
5	Screw thread micrometer	1
6	Inside micrometer 25-50 mm	6
7	Slip gauges	2
8	Gear tooth vernier	2
9	Universal bevel protractor	3
10	Combination set	1
11	Sine bar 200mm	1
12	Tool makers straight edge	2
13	Feeler gauge	2
14	Dial test indicator with magnetic stand	3
15	V-block	1
16	Surface plate	1
17	Spirit level	2
18	Go & No Go gauges set	1

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

32236 – MANUFACTURING TECHNOLOGY PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name	**:**	DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code	:	1220
Subject Code	**:**	32236
Semester	**:**	III
Subject Title	**:**	**MANUFACTURING TECHNOLOGY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: **15 weeks**

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration (Hrs)
			Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
Manufacturing Technology Practical	**5**	**75**	**25**	**75**	**100**	**3**

OBJECTIVES:

- Identify the parts of a centre lathe
- Identify the work holding devices
- Set the tools for various operations
- Operate the lathe and Machine a component using lathe Identify the tools used in foundry.
- Identify the tools and equipments used in welding Prepare sand moulds for different patterns.
- Perform welding operation to make different types of joints.
- Identify the different welding defects.
- Appreciate the safety practices used in welding

1. Lathe

Syllabus

1. Introduction of safety in operation machines.
2. Introduction to lathe and its parts.
3. Introduction to work holding devices and tool holding devices.
4. Types of tools used in lathe work
5. Types of measuring instruments and their uses.
6. Setting of work and tools.
7. Operation of lathe
8. Practice on a lathe

Exercises :

1. Plain turning
2. Step turning
3. Taper turning
4. Thread cutting and knurling
5. Bushing

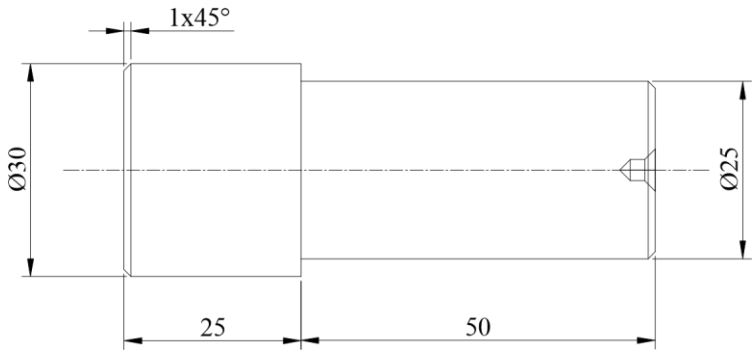
Lathe Works

Manufacture and estimate the cost of the following exercises by assuming the suitable raw material for the final size of the components.

Note to the faculty :- Last job of the raw material(MS Rod Ø32x77mm and MS Rod Ø25x77mm) to be retained in student wise or batch wise (Maximum Two Students per batch).This may be verifiable at the time of Board Practical Examination by the external examiner

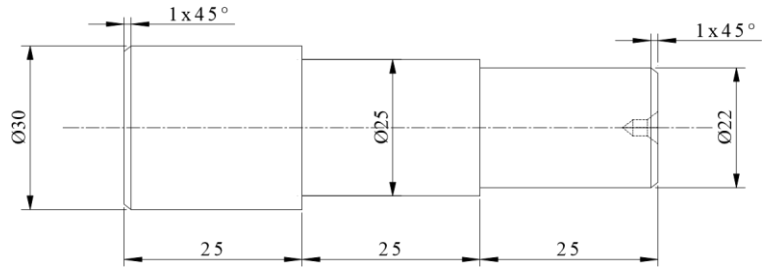
Exercise No:1 –Plain turning .

Raw Material: MS Rod Ǿ32x77mm



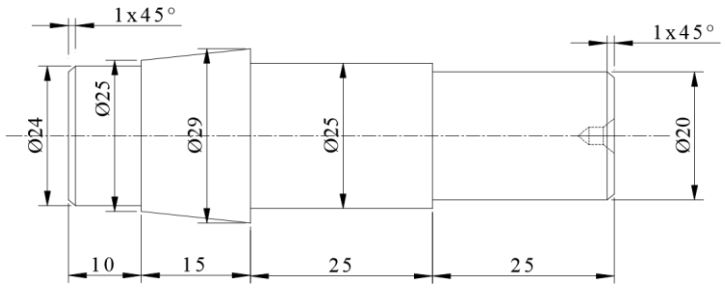
Exercise No:2-Step turning

Raw Material: Exercise No:1



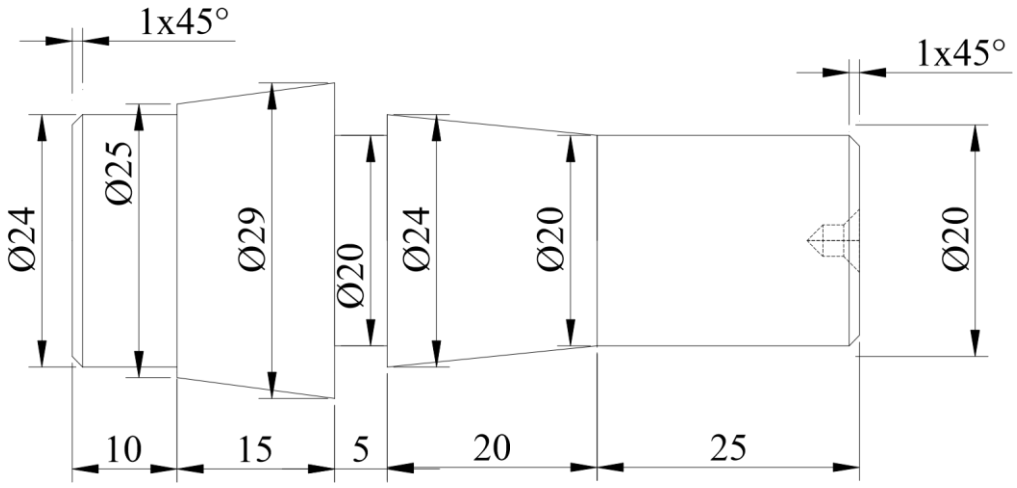
Exercise No:3-Step and taper turning

Raw Material: Exercise No:2



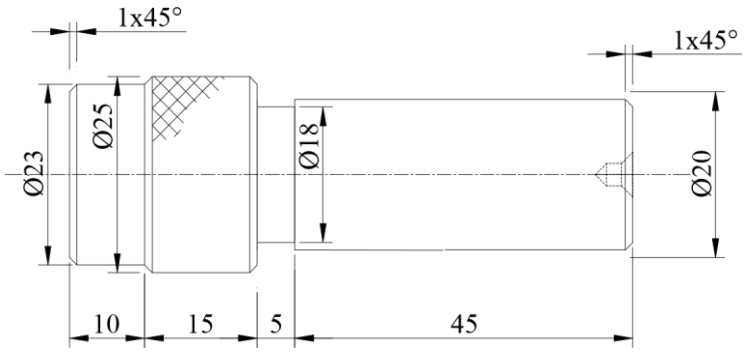
Exercise No: 4-Step and taper turning

Raw Material: Exercise No: 3



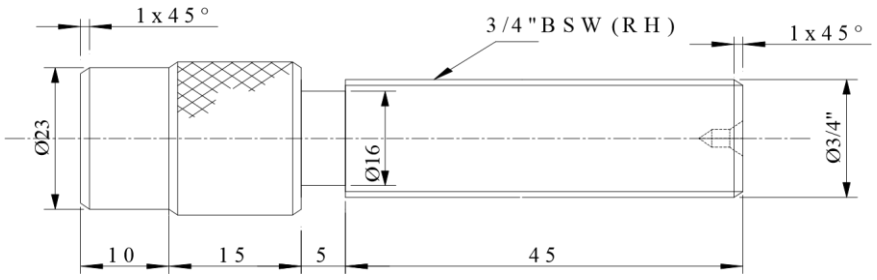
Exercise No: 5 Knurling and step turning

Raw Material: Exercise No:4



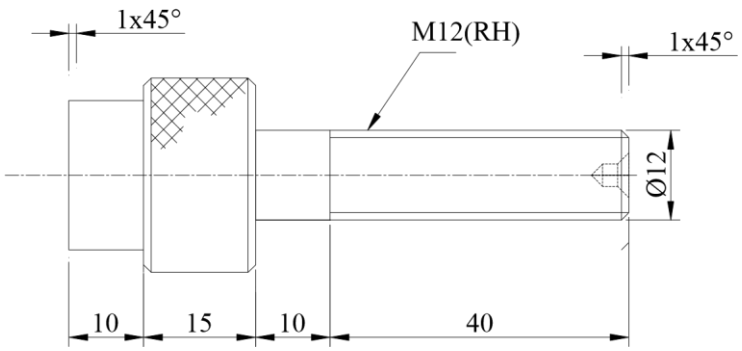
Exercise No:6 BSW Thread cutting

Raw Material: Exercise No:5



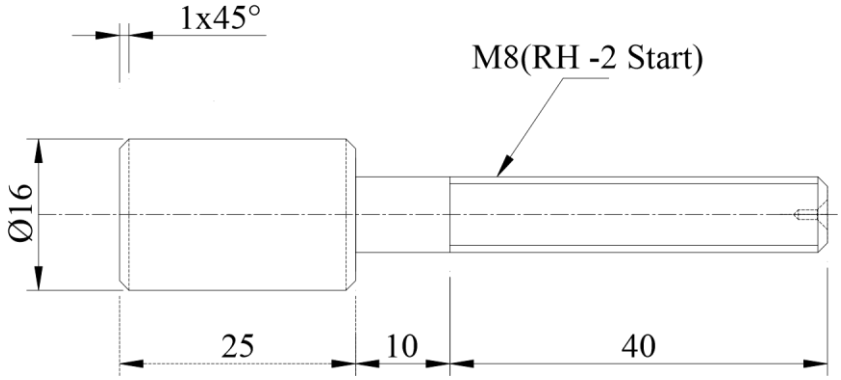
Exercise No:7 – Metric thread cutting

Raw Material: Exercise No:6



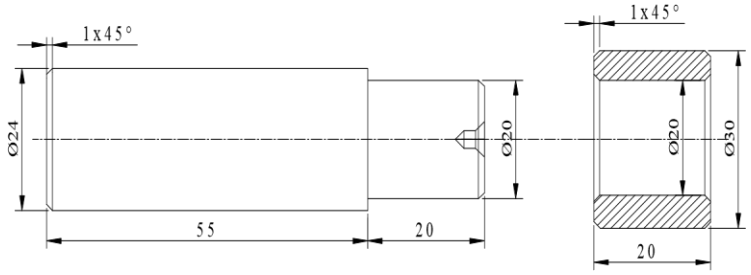
Exercise No:8- Metric thread cutting

Raw Material: Exercise No:7



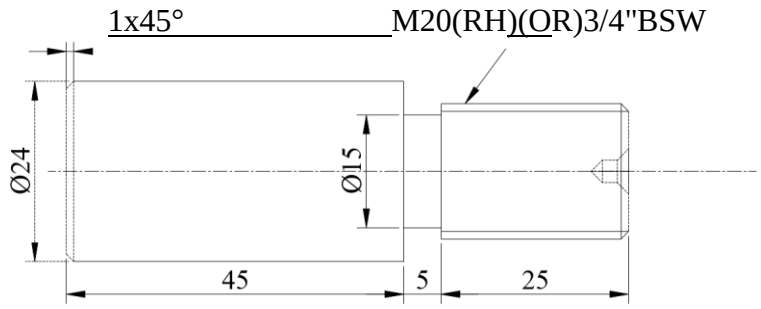
Exercise No: 9-Shaft and bush mating

Raw Material: MS Rod Ø25x77mm and Ø32x30mm



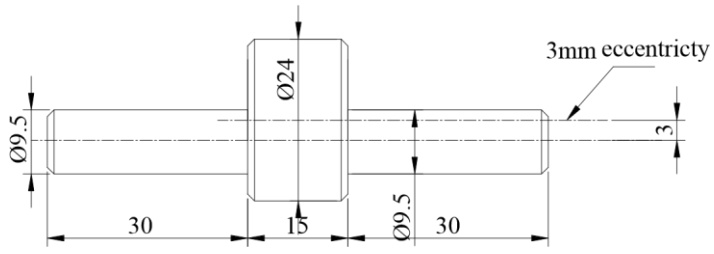
Exercise No: 10- Thread cutting

Raw Material: Exercise No:9



Exercise No:11-Eccentric Turning

Raw Material: Exercise No:10



2. **Foundry**

Syllabus

1. Introduction of tools and equipments
2. Types of patterns
3. Types of sand
4. Preparation of sand moulds
5. Furnaces – crucible furnace and tilting furnace
6. Melting if non ferrous metal
7. Core sands, preparation of cores

Exercises :

Preparation of sand mould :

1. Solid pattern
    a. Stepped pulley
    b. Bearing top
    c. Gear Wheel
    d. T-pipe
2. Split pattern
    a. Bent Pipe
    b. Tumbles
3. Loose Piece Pattern – Dove tail
4. Cylindrical core making
5. Melting and casting – (not for Examination, only for class exercises)

3. Welding

Syllabus

1. Introduction of Safety in welding shop
2. Introduction to hand tools and equipments
3. Arc and gas welding equipments
4. Types of joint

Exercises :

1. **Arc welding**
   - Lap joint (Material : 25 mm x 3mm Ms flat)
   - Butt joint (Material : 25mm x 6mm Ms flat)
   - T- joint (Material : 25mm x 3mm Ms flat)
   - Corner joint (Material : 25mm x 3mm Ms flat)

2. **Gas Welding**
   - Lap joint (Material : 25mm x 3mm Ms flat)
   - Butt joint (Material : 25mm x 6mm Ms flat)
3. **Gas cutting : Profile cutting**
4. **Spot welding – Lap joint (18/20swg)**
5. **Demonstration of Soldering and brazin**

Scheme of Examination

Lathe	**:**	**45marks(2hours)**
Foundry (or) Welding	**:**	**25marks(1hour)**
Viva-voce	**:**	**05 marks**
Total	**:**	**75 marks**

LIST OF EQUIPMENTS

Turning:

1. Center Lathe 4 ½ ‘ Bed length	–	15 No’s
2. 4 Jaw / 3 Jaw Chucks	–	required Numbers
3. Chuck key (10 mm x 10 mm size)	–	15 No’s
4. Box spanner	–	15 No’s
5. Cutting Tool H.S.S ¼ ‘’ X ¼ ‘’ X 4 ‘’ long	–	15 No’s
6. Pitch gauge	–	5 Nos
7. Vernier Caliper (0-25 and 25-50)	–	5 nos each
8. Micrometer, Inside and Outside(0-25 and 25-50)	-	5 each
9. Vernier Height Gauge(300mm)	-	1 no
10. Snap gauge	–	1 set
11. Gear tooth Vernier	-	1 No
12. Parallel Block	-	2 Nos
13. Steel Rule (0-150)	–	15 Nos.
14. Outside and Inside Calipers	-	15 Nos. each
15. Thread gauge	–	5 Nos.
16. Bevel Protractor	–	1 No
17. Jenny Caliper	–	5 Nos.
18. Dial Gauge with Magnetic Stand	–	5 Nos.
19. Marking Gauge	–	10 Nos.
20. Safety Glass	–	15 Nos.

Welding:

1. Arc welding booth	–	2 No’s with oil /air cooled Welding transformer with accessories
2. Gas welding unit (Oxygen and acetylene cylinder)	–	1 Set
3. Flux	–	500grams
4. Electrode 10 SWG	–	200 No’s
5. Face shield	–	3 No’s
6. Gas welding goggles	–	2 No’s
7. Leather Glows 18’’	–	4 Set
8. Flux chipping hammer	–	4 No’s
9. Spot welding machine	-	1 No

Foundry:

1. Crucible furnace	-	1 No
2. Tilting furnace	-	1 No
3. Shovel	-	20 Nos
4. Rammer set	-	30 Nos
5. Slick	-	30 Nos
6. Strike-off bar	-	30 Nos
7. Riddle	-	15 Nos
8. Trowl	-	30 Nos
9. Lifter	-	30 Nos
10. Sprue pin	-	60 Nos
11. Brush	-	20 Nos
12. Vent rod	-	30 Nos
13. Draw spike	-	30 Nos
14. Gate cutter	-	30 Nos
15. Cope box	-	30 Nos
16. Drag box	-	30 Nos
17. Core box	-	10 Nos
18. Runner & riser	-	60 Nos
19. Moulding board	-	30 Nos
20. Patterns	-	15 Nos each

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

30001 – COMPUTER APPLICATIONS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU.

M- SCHEME

(Implemented from the academic year 2016-2017 onwards)

Course Name : For All Branches

Subject Code : 30001

Semester : III

Subject title : COMPUTER APPLICATIONS PRACTICAL

TEACHING & SCHEME OF EXAMINATION:

No. of weeks per Semester: 15 Weeks

Course	Instruction		Examination			
			Max.			Duration
	Hours/ week	Hours/ Semester	Internal Assessment	Board Examination	Total	
COMPUTER APPLICATIONS PRACTICAL	4Hrs	60 Hrs	25	75	100	3Hrs

RATIONALE:

The application of Computer knowledge is essential the students of all disciplines of Engineering in addition to their respective branch of study. The Computer Application Practical course facilitates the necessary knowledge and skills regarding creating, working and maintaining the documents and presentation of documents with audio visual effects ina computer and produces necessary skills in E- Learning and Chatting tools..

OBJECTIVES:

On completion of the following exercises, the students will be able to

- Use the GUI operating systems
- Familiarize and customize the desktop
- Use the different facilities available in the word processor
- Prepare Power Point presentation with different formats
- Expose E-learning tools and chatting tools
- Analyze the datasheet
- Create and manipulate the database
- Create different types of charts
- Prepare PowerPoint presentation

- Understand Internet concepts and usage of e-mail

GUIDELINES:

- All the experiments given in the list of experiments should be completed and all the experiments should include for the end semester practical examination.
- The computer systems should be 1:1ratioforpracticalclasses

SYLLABUS
LAB EXERCISES
SECTION – A

GRAPHICAL OPEARTING SYSTEM

Introduction to GUI OS; Features and various versions of GUI OS & its use; Working with GUI OS; My Computer & Recycle bin ; Desktop, Icons and Explorer; Screen description & working styles of GUI OS; Dialog Boxes & Toolbars; Working with Files & Folders; simple operations like copy, delete, moving of files and folders from one drive to another, Shortcuts &Autostart; Accessories and Windows Settings using Control Panel- setting common devices using control panel, modem, printers, audio, network, fonts, creating users, internet settings, Start button & Program lists; Installing and Uninstalling new Hard ware & Software program on your computer - Copying in CD/DVD settings – Recording Audio files.

Exercises

1. a. Installing screen saver and change the monitor resolution by 1280X960
   b. Setting wall papers
   c. Creating, moving, deleting and renaming a folder
   d. Copy, paste and cut a folder/file
   e. Displaying the properties for a file or folder
2. a. Restoring files and folders from Recycle bin
   b. Creating short cuts for folder/file
   c. Finding a file or folder by name
   d. Selecting and moving two or more files/folders using mouse
   e. Sorting folders/files.

WORD PROCESSING

Introduction to Word Processing – Examples- Creation of new documents, opening document, insert a document into another document. Page setup, margins, gutters, font properties, Alignment, page breaks, header footer deleting, moving, replace, editing text in document. Saving a document, spell checker.

Printing a document. Creating a table, entering and editing, Text in tables. Changing format of table, height width of row or column. Editing, deleting Rows, columns in table. Borders, shading, Templates, wizards, drawing objects, mail merge.

Exercises

3. Create the following table and perform the operations given below

<table>
<tr><th>DAYS</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td>MON</td><td colspan="2">←TEST→</td><td colspan="2">A: JPP
B:RDBMS</td><td>CA</td><td>RDBMS</td><td>TUT</td></tr>
<tr><td>TUE</td><td>CA</td><td>OOP</td><td>CN</td><td>RDBMS</td><td colspan="3">A: RDBMS
B: JPP</td></tr>
<tr><td>WED</td><td>CN</td><td>RDBMS</td><td>OOP</td><td>RDBMS</td><td colspan="2">COMMUNICATION</td><td>CN</td><td>CA</td></tr>
<tr><td>THU</td><td>OOP</td><td colspan="3">A: JPP
B: RDBMS</td><td>CA</td><td>RDBMS</td><td>CN</td><td>OOP</td></tr>
<tr><td>FRI</td><td colspan="2">COMMUNICATION</td><td colspan="2">A: RDBMS
B: JPP</td><td>OOP</td><td>CN</td><td>RDBMS</td><td>CA</td></tr>
<tr><td>SAT</td><td>OOPS</td><td>RDBMS</td><td>CN</td><td>CA</td><td colspan="4">---------</td></tr>
</table>

4. Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.

5. Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background colour and add ‘confidential’ as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.

SPREADSHEET

Introduction to Analysis Package – Examples - Concepts of Workbook & Worksheets; Using Wizards; Various Data Types; Using different features with Data, Cell and Texts; Inserting, Removing & Resizing of Columns & Rows; Working with Data & Ranges; Different Views of Worksheets; Column Freezing, Labels, Hiding, Splitting etc.; Using different features with Data and Text; Use of Formulas, Calculations & Functions; Cell Formatting including Borders & Shading; Working with Different Chart Types; Printing of Workbook & Worksheets with various options.

Exercises

6. Create a result sheet containing Candidate's Register No., Name, Marks for six subjects. Calculate the total and result. The result must be calculated as below and failed candidates should be turned to red.

   Result is Distinction if Total >= 70 %

   First Class if Total > = 60 % and < 70 %

   Second Class if Total >= 50 % and < 60 %

Pass if Total >= 35 % and < 50 %

Fail otherwise

Create a separate table based on class by using auto filter feature.

7. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue color and lowest donation with red colour. The table should have a heading.

8. Create line and bar chart to highlight the sales of the company for three different periods for the following data.

SALES BAR CHART

Period	Product1	Product2	Product3	Total
JAN	35	40	50	125
FEB	46	56	40	142
MAR	70	50	40	160

SECTION – B

DATABASE

Introduction – Menus – Tool bar – Create – Edit – Save – Data types – Insert – Delete – Update – View – Sorting and filtering – Queries – Report – Page setup – Print.

Exercises

9. Create Database to maintain at least 10 addresses of your class mates with the following constraints

- Roll no. should be the primary key.
- Name should be not null

10. create a students table with the following fields: Sr.No, Reg. No, Name, Marks in 5 subjects. Calculate total and percentage of 10 students. Perform the following queries.

- To find the details of distinction student
- To find the details of first class students
- To find the details of second class students

11. Design a report for the above exercise to print the consolidated result sheet and mark card for the student.

PRESENTATION

Introduction - Opening new presentation, Parts of PowerPoint window – Opening -Saving and closing presentations - Features of PowerPoint, Background design, Word art, Clip art, Drawings,3D settings - Animations, Sound, Views, types of views - Inserting and deleting

slides, arranging slides, slides show, rehearsal, setup show, custom show - Creating custom presentations, action setting, auto content wizard, working with auto content wizard

Exercises

12. Make a marketing presentation of any consumer product with at least 10 slides.
    Use different customized animation effects on pictures and clip art on any four of the ten slides.
13. Create a Presentation about our institution or any subject with different slide transition with sound effect.

INTERNET

Introduction – Getting acquainted with Internet Connection - Browsers – Website URL - Open a website – Net Browsing - Email: Creating E-mail id – Sending , receiving and deleting E-mail - Email with Attachments – CC and BCC - Chatting – Creating Group mail - Google docs – Search Engines – Searching topics .

Most Popular Social Networking Sites : History – Features – Services – Usage of Face book , Twitter and Linkdln.

Transferring data through wifi / bluetooth among different devices.

Introduction to cybercrime – Software Piracy – Viruses – Antivirus Software

Exercises

14. Create an e-mail id and perform the following
    - Write an e-mail inviting your friends to your Birthday Party.
    - Make your own signature and add it to the e-mail message.
    - Add a word attachment of the venue route
    - Send the e-mail to at least 5 of your friends.

15. Create a presentation on Google docs. Ask your friend to review it and comment onit. Use "Discussion" option for your discussions on the presentation.

Hardware and Software Requirements

Hardware Requirements:

- Computers – 36Nos
    - Intel Core i3 Processor
    - 500 GB Hard Disk, 2 MB RAM
    - 14" Monitor
- Projector – 1 Nos
- Laser Printer – 1 No
- Internet Connection – Minimum of 512 KB

Software Requirement

- Any GUI Operating System
- Open Source Software / MS- Office

1. SemesterEndExamination–75 Marks

Content	Max.Marks
Writing Procedure – One Question from Section A	15
Demonstration	15
Results with Printout	5
Writing Procedure – One Question from Section B	15
Demonstration	15
Results with Printout	5
Viva voce	5
Total	**75MARK**

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

32241 – ENGINEERING MATERIALS AND METALLURGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name **:** DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32241
Semester : IV semester
Subject title : **Engineering Materials and Metallurgy.**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: **15 weeks**

Subject	Instruction		Examination			
Engineering Materials and Metallurgy	Hours/Week	Hours/Semester	Assessment Marks			Duration (Hrs)
	5	75	Internal Assessment (Marks)	Board Examination (Marks)	Total	
			25	75	100	3

TOPICS AND TIME ALLOCATION:

UNIT	TOPIC	TIME (Hrs)
I	Metallurgy and Material Structure	14
II	Phase diagrams and Iron Carbon equilibrium diagram	14
III	Heat Treatment and Properties of Engineering Materials	14
IV	Ferrous and Non – Ferrous Metals and their Alloys	14
V	Metallographic, Surface Treatment and Non Destructive Testing	14
	TEST & REVISION	05
	Total	75

Rationale:-

The knowledge about the various types of Engineering Materials, their properties and applications are required for proper selection and use of materials in Tool Design and design of mechanical engineering components. Thorough understanding of the methods of heat treatment, their effect and applicability is essential to ensure the full service life of the tools and components. The knowledge on various metallographic and non destructive testing methods is necessary to verify the properties, condition and nature of various materials.

OBJECTIVES

The objective of this course is to make the Student:

- To know about the different types of material structure.
- To acquire knowledge on Deformation of Metals.
- To Understand the Phase Diagrams.
- To Understand and Use Iron – Carbon Equilibrium Diagram.
- To Study about various Heat Treatment Process.
- To Get Knowledge on Thermal & Magnetic properties of Materials.
- To know about Superconductivity.
- To study about various Ferrous & Non Ferrous Alloys.
- To understand the process of Non – Destructive Testing.

32241- Engineering Materials and Metallurgy

DETAILED SYLLABUS

Unit No.	Name of the Topics	Hours
I	**METALLURGY AND MATERIAL STRUCTURE:** **1.1 Crystalline Structure** Crystallography, crystal, single crystal, crystallization of metals, crystal symmetry, elements of symmetry, space lattice, unit cell, lattice parameters of unit cell, primitive cell, crystal structure, crystal system – cubic system, Tetragonal system, Hexagonal or trigonal system, orthorhombic system, monoclinic system, triclinic system. Miller Indices, Crystal directions, coordinate number, atomic radius, number of atoms per unit cell, density of crystal material. Material structure – Face centered cubic (FCC), Body centered cubic (BCC), Hexagonal close-packed (HCP). **1.2 Bonding in solids** Primary bonds – Metallic bond, Ionic bond, Covalent bond. Imperfections in metal crystals- types of defect- point defect, line defect, surface defect, volume defect, effect of imperfection on metal properties **1.3 Deformation of metals:** Elastic deformation, plastic deformation, elastic after effect. Deformation by slip, ideal plastic body. Plastic deformation of a single crystal – slip, twinning. cold working and effect of cold working on metals. Hot working of metals, advantages and disadvantages of hot working.	**14**

II	**PHASE DIAGRAMS AND IRON CARBON EQUILIBRIUM DIAGRAM:** **2.1 Phase Diagrams:** Solid solution – types of solid solution- substitutional and interstitial solid solution- solid solution alloy – System, Phase, Component, Degree of freedom or variance of the system. Phase rule, Cooling curves – cooling curve of pure metal, solidification or crystallization of metal, cooling curve of eutectic type alloy. Construction of equilibrium diagrams, Interpretation of equilibrium diagrams. Types of phase diagrams – Eutectic system, Peritectic system, Eutectoid system, Peritectoid system. Iron-Carbon system – allotropy of iron, micro constituents of iron and steel, Iron-iron carbide equilibrium diagram, critical temperatures, effect of alloying elements on Fe-Fe_3C diagram. **2.2 Heat Treatment and Transformation Diagram :** Purpose of Heat Treatment, Heat treatment cycle, Time-Temperature-Transformation (TTT) diagram – importance of T.T.T diagram, steps to construct T.T.T diagram, T.T.T diagram for eutectoid steel, T.T.T diagram and cooling curves.	**14**
III	**HEAT TREATMENT, PROPERTIES OF ENGINEERING MATERIALS:** **3.1 Heat Treatment of Steel:** Annealing – stress relief annealing, Process annealing, spheroidise annealing, Full annealing. Normalizing, Hardening – process, quenching medium, hardenability, end quench hardenability test. Tempering – low temperature tempering, medium temperature tempering, High temperature tempering, Temper brittleness, Austempering, Martempering. Case hardening – carburising – pack carburising, liquid carburising, gas carburising. Nitriding, cyaniding, carbonitriding. Surface hardening – flame hardening, induction hardening. **3.2 Properties of Engineering Materials:** Introduction, Mechanical properties of Materials – Strength, Elasticity, Plasticity, Ductility, Malleability, stiffness, toughness, brittleness, hardness, wear resistance, machinability, castability, weldability, fatigue strength, creep. Thermal Properties – Introduction, Heat capacity, Expansion, conductivity, Thermal stress. Magnetic Properties – Introduction, Diamagnetism, Para Magnetism, and Ferromagnetism, Influence of Temperature on Magnetic Behavior. Superconductivity. Chemical Properties – Introduction, Corrosion & Degradation, Forms of Corrosion, Corrosion environment, Corrosion Prevention, Oxidation	**14**
IV	**FERROUS AND NON – FERROUS METALS AND THEIR ALLOYS:** **4.1 Ferrous Metals & its Alloys:** Pig Iron – classification, properties and applications, Wrought Iron –	**14**

	composition, properties and uses. Cast Iron – Introduction, classification, effects of alloying elements on the structure of cast iron. Designation system of Cast Iron as per BIS . Composition, Mechanical properties, applications of Grey cast iron, Spheroidal graphite cast iron, Malleable cast iron .Steels – Classification of steel, Effects of alloying elements in steel. Composition, Mechanical properties, applications of low carbon steel, medium carbon steel and high carbon steel. HSS , Tool steel, Stainless steel - Composition ,Mechanical properties and applications **4.2 Non – Ferrous Metals & its Alloys:** Aluminium & its alloys – types, properties and applications. Designation system of aluminium and its alloys as per BIS .Copper & its Alloys – Types , Brass, Gunmetal – Composition , properties & applications, Zinc – Composition , properties & applications`	
V	**<u>Metallography, Surface Treatment and Non Destructive Testing</u>** **5.1 Metallography :** Metallurgical microscope – Preparation of specimen, micro and macro examination. Study of micro structure of Ferrous and Non Ferrous metals. Modern techniques of material studies – electron microscope, photoelectron spectroscopy. **5.2 Surface Treatment:** Mechanical cleaning and finishing – Vibratory finishing, wire brush cleaning, buffing and electro polishing. Chemical cleaning – Vapour degreasing, solvent cleaning, alkaline cleaning, ultrasonic cleaning, acid pickling. Surface coatings – Electroplating, painting, powder coating, blackening, vacuum Metalising , Physical vapour deposition, chemical vapour deposition. **5.3 Non Destructive Testing:** Magnetic particle inspection, X-Ray inspection, Gamma radiography, Ultrasonic Inspection, Electrical methods, Damping test, Non magnetic methods of crack detection.	**14**
	REVISION & TEST	05

Text Books:

1. Dr . O.P.Khanna , Material science and Metallurgy, Dhanpat Rai & Sons
2. Material Science and Engineering ,William .D.Callister JR , Sixth Edition

References Books

1. ASM Hand book, Vol.1, ASM International, Materials Park, Ohio, U.S.A, 1990.
2. Alok Nayar, The Metals Data Book, Tata McGraw-Hill Publishing Company Limited, first edition, 1997.
3. S.K.Hajra Choudhury and A.K.Hajra Choudhury, Elements of Workshop Technology, Media Promoters and publishers pvt. Ltd, 1982.

4. Metals Handbook, vol.3, 9th edition, American Society for Metals, Metals Park, Ohio, U.S.A.,1980.
5. R.B.Guptha, Material Science and Processes, Satya Prakashan Inc., Tech India Publications, 4th edition,1983.
6. S.N.Bagchi and Kuldip Prakash, Industrial Steel Reference book, New Age International Limited, Publications, 2nd edition, 1995.
7. Mechanical Metallurgy – Dieter.
8. Physical Metallurgy – Lakhtin.
9. Elements of Physical Metallurgy – Sydney Anver.
10.Engineering Metallurgy ,Part –I , Raymond A.Higgins , Sixth Edition

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

32242 – FLUID POWER AND THERMAL ENGINEERING

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32242
Semester : IV
Subject Title : **FLUID POWER AND THERMAL ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: **15 weeks**

SUBJECT	Instructions		Examination			
			Marks			Duration (Hrs)
	Hours/ Week	Hours/ Semester	Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
FLUID POWER AND THERMAL ENGINEERING	**5**	**75**	**25**	**75**	**100**	3

Topics and Time allocation

UNIT	TOPIC	TIME (Hrs)
I	PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS	14
II	PNEUMATIC SYSTEM	14
III	HYDRAULIC SYSTEM	14
IV	THERMODYNAMICS	14
V	INTERNAL COMBUSTION ENGINES AND HEAT EXCHANGERS	14
	TEST & REVISION	05
	Total	75

RATIONALE:

The growth of Engineering and Technology is associated with fluid power applications and heat & work transfer. Low cost Automation using Pneumatics and Hydraulic machines and presses are very common in Automobile and Die casting industries. Hence studying the fundamentals of Pneumatics, Hydraulics and Heat transfer facilitates better understanding of their applications in the area of Tool & Die Making and widens the employment opportunities.

OBJECTIVES

At the end of the study of this subject the student will be able to:

- Define the properties of fluids
- Explain the working of pressure measuring devices
- Appreciate the use of fluid power
- Explain the working of pneumatic system and its elements
- Explain the working of Hydraulic system and its elements
- Compare Pneumatic system with Hydraulic system
- Design fluid power circuits for industrial applications
- Explain the concept and application of thermodynamics
- Compare various thermodynamic processes
- Explain the working of heat exchanger and its effectiveness

32242 - FLUID POWER AND THERMAL ENGINEERING

DETAILED SYLLABUS

Contents: Theory

UNIT NO	NAME OF THE TOPIC	HOURS
I	**PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS** Fluid-Definition-Classification of fluids-Ideal and real fluids-Newtonian and non-Newtonian-Properties of fluids-Density, Specific weight, Specific volume, Specific gravity, Compressibility, Viscosity, Surface tension and capillarity. Pressure-Unit of pressure-Pressure head-Atmospheric pressure-Gauge pressure and Absolute pressure-Problems-Pascal's law-Proof-Applications of Pascal's law-Hydraulic press, Hydraulic jack. Pressure Measurement -Piezometer tube-Simple U-tube manometer-differential U- tube manometer-Inverted differential U-tube manometer-Micro manometer-Inclined tube micro manometer-Problems-Mechanical Pressure gauge-Bourdan tube pressure gauge-Diaphragm pressure gauge-Dead weight pressure gauge.	14
II	**PNEUMATIC SYSTEM** Pneumatic system and its elements-Filter, Pressure regulator, Lubricator unit-Pressure control value-3/2 DCV, 5/2DCV, and 5/3DCV-Check value-Flow control value-Throttle value-Shuttle valve-Quick exhaust valve-Time delay value-Pneumatic actuators-Single acting cylinder, Double acting cylinder, Air motor, ISO symbols of Pneumatic components. Pneumatic Circuits-Direct operation of single acting cylinder-Operation of double acting cylinder-Operation of double acting cylinder with metering-in control-Operation of double acting cylinder with metering-out control-Use of shuttle valve in pneumatic circuit-Use of quick exhaust valve in pneumatic circuits-Automatic operation of double acting cylinder-Merits and Demerits of pneumatic system-Applications.	14
III	**HYDRAULIC SYSTEM** Hydraulic system and its elements-Merits, Demerits and applications of hydraulic system. Hydraulic pumps-types-positive displacement pumps and non - positive displacement pumps -Gear pumps-External gear and internal gear type-vane pump-Axial piston pump and Radial piston pump-Hydraulic cylinders and Hydraulic motors - ISO symbols for hydraulic components -pressure relief valve-Directional control valves-3/2DCV,4/2DCV,4/3DCV. Hydraulic accumulator and its uses-Types-Gravity type accumulator, spring loaded accumulator, Gas loaded accumulator-Pressure intensifier. Hydraulic circuits-Operation of double acting cylinder using metering-in	14

	control and metering out control-Operation of Hydraulic motor using metering-in and metering out- control Hydraulic circuit using sequence valves and counter balance valves - Hydraulic circuit for shaping machine, surface grinding machine and Milling machine. Comparison of Hydraulic system and Pneumatic system.	
IV	**THERMODYNAMICS** Thermodynamic system-Types-Closed system, Open system and isolated system-Property and state of a system-Intensive and Extensive properties -Thermodynamic process-Cycle-Point and Path functions-Law of conservation of energy-Thermodynamic equilibrium-Zeroth law, First law and Second law of thermodynamics. Law of perfect gases-Boyle's law, Charle's law, Joule's law, Regnault's law-Equation of state-Universal gas constant-Relationship between the specific heats and gas constants. Expansion of gases-Thermodynamic process-Constant volume-Constant pressure, Isothermal, Reversible adiabatic, Polytropic -free expansion and throttling processes- P-V diagram- work done, change in internal energy, heat transfer, change in enthalpy and Change in entropy for various processes-Problems only (No Derivations).	14
V	**INTERNAL COMBUSTION ENGINES AND HEAT EXCHANGERS** Introduction to IC Engines-Classification-Working of four stroke cycle petrol and diesel engines-Merits & Demerits-Working of two stroke cycle petrol and diesel engines-Merits & Demerits-Comparison of four stroke and two stroke engines. Heat transfer in engineering –Modes of heat transfer-Conduction, Convection and Radiation. Heat transfer by conduction-Fourier law of heat conduction-Thermal conductivity of engineering materials-Heat conduction through plane wall-Heat conduction through composite wall-Simple problems. Newton's law of cooling-Stefan Boltzmann law of radiation. Heat exchanger-types, parallel flow heat exchanger, counter flow heat exchangers-Application of heat exchangers. Temperature distribution for a parallel flow heat exchanger-Log Mean Temperature Difference (LMTD) - the heat transfer. Temperature distribution for a counter flow heat exchanger- LMTD - the heat transfer through counter flow heat exchanger-Simple problems in heat exchangers.	14
	TEST & REVISION	**05**

Text Books:

1. Sundaramurthy, Fluid Mechanics and Fluid Power, Narayana publications
2. Nag.P.K., Engineering Thermodynamics, Tata Mc Graw Hill
3. R.C.Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, Fourth edition, New age international publishers.
4. R.Srinivasan, Hydraulic and Pneumatic controls, Vijay Nicole Imprints PVT.LTD, second edition, Chennai

Reference Books:

1. Khurmi.R.S, A Test book of Hydraulics, Fluid Mechanics and Hydraulic Machines, S Chand & CO
2. Khurmi R.S and Kupta.K, A Text book of Thermal Engineering, S Chand & CO
3. Ballaney.B.L., Applied Thermodynamics , Kanna publishers
4. Bansal.R.K, Fluid Mechanics and Hydraulic Machines
5. Elango.S & Soundarajan.V, Introduction to Hydraulics and Pneumatics, PHI learning Pvt Ltd, 2011 second Edition

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

32243 – TOOL ROOM SPECIAL MACHINES

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code	:	1220
Subject Code	:	32243
Semester	:	IV
Subject Title	:	**TOOL ROOM SPECIAL MACHINES**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: **15 weeks**

Subject	Instructions		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
TOOL ROOM SPECIAL MACHINES	5	75	25	75	100	3 Hrs

Topics and Allocation of Hours:

UNIT	Topic	TIME (Hrs)
I	CUTTING TOOLS AND MECHANICS OF CUTTING	14
II	BORING, JIG BORING, JIG GRINDING AND TOOL & CUTTER GRINDER	14
III	MILLING MACHINES AND GEAR GENERATION PROCESSES	14
IV	CNC MACHINE AND ITS COMPONENTS	14
V	UN-CONVENTIONAL MACHINING	14
	TEST & REVISION	05
	TOTAL	75

RATIONALE:

Globalization and technological advances making tremendous growth in industrial activities, which in turn needs tool and die makers for most of the engineering products manufacturing industries. To meet out such demand and to sustain we have to explore the knowledge about tool room special machines covering the various operations and skill set required for the development of nation and its people.

OBJECTIVES:

At the end of the study of this subject the student will be able to:

- Describe the different forces in orthogonal and oblique cutting
- Estimate the forces in metal cutting operations
- Describe about various cutting tool materials
- Explain the cutting force measurement principles
- Compare the properties of different cutting fluids
- Describe about jig boring and jig grinding
- Explain about tool and cutter grinder
- Explain the milling machine principles, types and its various operations
- Explain the various gear generation processes
- Explain the principle of operation of various un-conventional machining processes
- Appreciate the use of un-conventional machining processes.
- Distinguish between EDM and Wire-cut EDM machine operation
- Describe about various types of jigs and its applications
- Describe about various types of CNC machines, operations and its components.

32243 - TOOL ROOM SPECIAL MACHINES

DETAILED SYLLABUS

Contents: Theory

UNIT NO	NAME OF THE TOPIC	HOURS
I	**CUTTING TOOLS & MECHANICS OF METAL CUTTING** Cutting tools- properties of cutting tool materials – cutting tool materials: High carbon steels, High speed steel, Carbides, Ceramics. Types of cutting tools - Types of metal cutting – orthogonal and oblique cutting – chip formation – continuous, discontinuous, built-up edge – shear angle. Tool signature - importance cutting forces in orthogonal cutting – metal removal rate (MRR) - Tool life: Taylor's life equation, factors influence in tool life. Measurement of cutting forces - Tool dynamometer – types of tool dynamometer - machinablility – machinablility index - factors affecting machinablility - cutting fluids – properties of cutting fluids – selection of cutting fluids	14
II	**BORING, JIG BORING, JIG GRINDING AND TOOL & CUTTER GRINDER** **Boring and Jig Boring** Boring machines - horizontal and vertical types - fine boring machines - boring tools Jig boring machine - measuring system - hole location procedure - deep hole boring. **Jig Grinder** Introduction – construction – operation techniques – setting up and clamping – wheel travel – wheel selection – wheel dressing. Optical Profile grinding – basic principle and operations. **Tool & Cutter Grinder** Introduction – selection of cutter – grinding wheels – shape, abrasive grain size and bond, direction of rotation – tooth rest, types, parts of the universal tool and cutter grinder, clearance, width of land – producing the clearance angle.	14

III	**MILLING MACHINES AND GEAR GENERATION PROCESSES** **Milling Machines**: Types-specification of milling machines – principle of operation of column & knee type and universal milling machine -work and tool holding devices: arbor, stub-arbor, spring collet, adapter-milling cutters: cylindrical milling cutter, slitting cutter, side milling cutter, angle milling cutter, T-slot milling cutter, woodruff milling cutter, fly cutter-nomenclature of cylindrical milling cutter-milling process: conventional milling and climb milling-milling operations - milling attachments. **Generating Process** Gear shaper - gear hobbling - principle of operation only gear finishing processes – gear burnishing – gear shaving – gear grinding and gear lapping - gear materials: cast iron, steel, alloy steels, brass, bronze, aluminum, nylon.	14
IV	. **CNC MACHINE AND ITS COMPONENTS** **CNC Machines:** Numerical control – definition – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centre – machine axes conventions turning centre and machining centre – Coordinate measuring machine – construction and working principle. **Components of CNC machine:** Slide ways – requirement – types – friction slide ways and antifriction slide ways - linear motion bearings – recirculation ball screw – ATC – tool magazine – feedback devices – linear and rotary transducers – Encoders - in process probing - tool material – tool inserts	14
V	**UN-CONVENTIONAL MACHINING** **Un-Conventional Machining Processes**: Construction, working and applications of Ultrasonic machining - Chemical machining -Electro Chemical Grinding - Plasma Arc Machining - LASER machining - Advantages – Disadvantages. **Electrical Discharge Machining**: Introduction – principle of spark erosion and requirements – mechanism – dielectric fluid – essential requirements of dielectric fluid – layout of spark machining system, EDM machine – tool materials – electrical circuits in EDM – Metal removal rate – mean current – operation parameters and typical values and tool wear – reasons – classification and types. EDM process characteristic – advantages and disadvantages of EDM process – wire-cut EDM, CNC Wire-cut EDM for machining punch and die cavities	14
	TEST & REVISION	05

TEXT BOOKS

1. Hajra choudhry, “Work shop Technology", Vol. II, Media Promoters and Publishers Pvt. Ltd.
2. Chapman.WAJ., “Work shop Technology", Vol. II & III, ELBS

REFERENCE BOOKS :

1. Paul De Garmo.E., & Others, "Materials and Processes in Manufacturing", Macmillan Publishing Company
2. Jain & Gupta, Production Technology, Khanna Publishers, 2-B, North Market, Naisarak, new Delhi
3. MOORE AND VICTORY, “ Holes, Contour And Surfaces”
4. HMT, “Production Technology”
5. BATTACHARYA, “Workshop Technology”P.C.SHARMA, “A Text Book of Production Engineering”, S.Chand & Co

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

32244 – COMPUTER AIDED MACHINE & TOOL DRAWING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32244
Semester : IV
Subject Title : **COMPUTER AIDED MACHINE & TOOL DRAWING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Computer Aided Machine & Tool Drawing Practical	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	INTRODUCTION TO CAD SOFTWARE	2
II	DRAWING AIDS AND EDITING COMMANDS	4
III	BASIC DIMENSIONING, HATCHING, BLOCKS AND VIEWS	5
IV	ISOMETRIC DRAWING, PRINTING AND PLOTTING	4
V	CAD DRAWING PRACTICE DETAILED DRAWINGS OF FOLLOWING MACHINE PARTS ARE GIVEN TO STUDENTS TO ASSEMBLE AND DRAW THE SECTIONAL OR PLAIN ELEVATIONS / PLANS / AND SIDE VIEWS WITH DIMENSIONING AND BILL OF MATERIALS USING CAD SOFTWARE – 13 EXERCISES: SLEEVE & COTTER JOINT, KNUCKLE JOINT, SCREW JACK, FOOT STEP BEARING, UNIVERSAL COUPLING, PLUMMER BLOCK, MACHINE VICE, PROTECTED TYPE FLANGED COUPLING, DRILL JIG, WELDING FIXTURE, BLANKING TOOL, PIERCING TOOL, INJECTION MOULDING TOOL.	60
	TOTAL	**75**

RATIONALE:

The contemporary progressing world is fast with the latest production systems. The advanced manufacturing of products is developed instantly using CAD Software. Even a small scale industry is now using a CAD software as it has become the heart of the Design department. So CAD has now become inevitable in industries. Accuracy and Precision are the two important things that decide the quality of a product to survive its competitors in the market. Using CAD software design, the uniform accuracy, multiples of copies and storing in a small space for long time are assured.

The CAD software considerably improves the creativity and flexibility of a designer. The syllabus here enables a candidate to draw an industrial drawing within the optimum reach of a diploma cadre.

OBJECTIVES:

- Appreciate the need of sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare hole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Practice on CAD commands in making 2D Drawings.
- Draw assembled drawings of different types of joints and couplings using CAD.
- Draw assembled drawings of various types of machine elements and Tool assembly using CAD.

32244 - COMPUTER AIDED MACHINE AND TOOL DRAWING PRACTICAL

DETAILED SYLLABUS

Contents: Theory

<table>
<tr><th>Unit</th><th>Name of the Topic</th><th>Hours</th></tr>
<tr><td>I</td><td>INTRODUCTION TO CAD SOFTWARE
Introduction – History of CAD – Applications – Advantages over manual drafting – Hardware requirements – Software requirements – Windows desktop – CAD screen interface – menus – Tool bars – How to start CAD – How to execute command – types of co-ordinate systems – Absolute – Relative – Polar.</td><td>2Hrs</td></tr>
<tr><td>II</td><td>DRAWING AIDS AND EDITING COMMANDS
Creating objects (2D) – Using draw commands – Line, Arc, Circle, Ellipse, Donut, Polygon, Point, Pline, Sketch, Trace – Creating 2D Solid. Creating text – Dtext, Mtext, Text styles – Mline, spline – Drawing with precision – Osnap options – drafting settings –limits – Units – drawing aids – Fill, Snap, Grid, Ortho lines – Function keys - Editing and modify commands – Object selection methods – Erasing object – Oops - Cancelling and undoing a command – Copy – Move – Array – Offset – Scale – Rotate – Mirror – Break – Trim – Extend – Explode. Divide – Measure – stretch – Lengthen – Changing properties – Color – line types –LT scale – Matching properties – Editing with grips – Pedit – Ddedit – Mledit.</td><td>4Hrs</td></tr>
<tr><td>III</td><td>BASIC DIMENSIONING, HATCHING, BLOCKS AND VIEWS
Basic dimensioning – Editing dimensions – Dimension styles – Dimension system variables. Machine drawing with CAD. Creation of blocks – Wblock – inserting a block – Block attributes – Hatching –Pattern types – Boundary hatch – working with layers - Controlling the drawing display – Blipmode – View group commands – Zoom, redraw, regen, regenauto, pan, viewres – Real time zoom. Inquiry groups – calculating area – Distance – Time – Status of drawing – Using calculator.</td><td>5Hrs</td></tr>
<tr><td>IV</td><td>ISOMETRIC DRAWING, PRINTING AND PLOTTING
Isometric drawing – Isometric projection – drawing isocircles – Dimensioning isometric objects. File commands – File Import and export – plotting drawing – external references – 3D fundamentals – 2D to 3D Conversion
3D Drawing : 3D Primitives-Extrude – Revolve-Slice-Section, Surface 3D Mesh-3D - Surface-3D Operation-Solid Editing</td><td>4Hrs</td></tr>
<tr><td>V</td><td>CAD DRAWING PRACTICE
Detailed drawings of following machine parts are given to students to assemble and draw the sectional or plain elevations / plans / and side views with dimensioning and bill of materials using CAD Software
<table><tr><th>MACHINE DRAWING</th><th>TOOL DRAWING</th></tr><tr><td>1. Sleeve & Cotter joint
2. Knuckle joint
3. Screw Jack</td><td>9. Drill jig
10. Welding fixture
11. Press tool assembly- Blanking tool</td></tr></table></td><td>60Hrs</td></tr>
</table>

	4. Foot step bearing 5. Universal Coupling 6. Plummer Block 7. Machine Vice 8. Protected type flanged coupling	12. Press tool assembly- Piercing tool 13. Plastic moulding tool assembly- Injection moulding tool	

Reference Books:

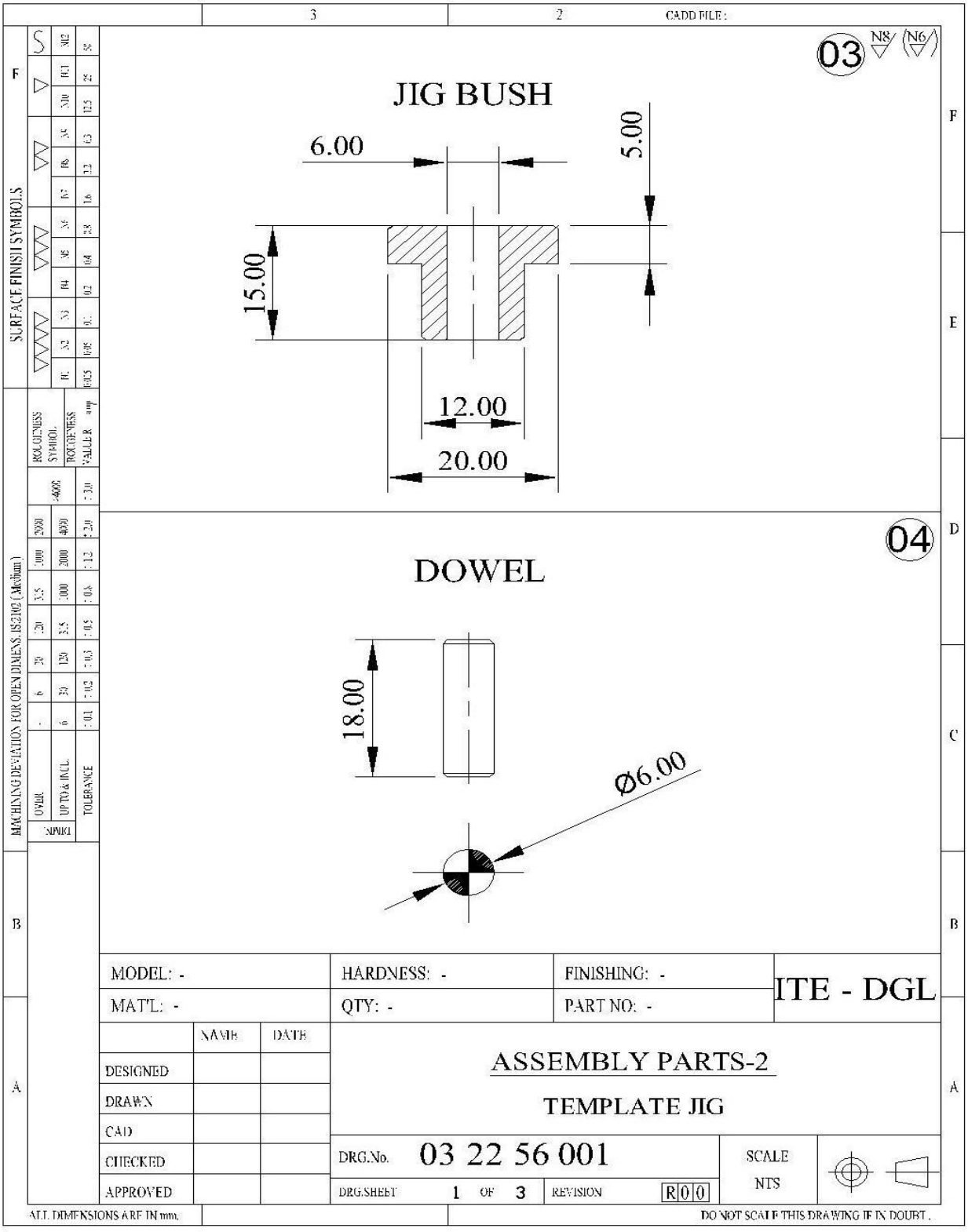
1) Inside AutoCAD - D. Raker and H. Rice - BPB Publications, NewDelhi
2) Engineering Drawing and Graphics + AutoCAD – K.Venugopal, - New Age International Publications
3) CAD/CAM/CIM - P. Radhakrishnan, S. Subramaniyan and V.Raju - New Age International Publications.
4) AutoCAD 2002 with Applications - Sham Tickoo - Tata Mcgraw Hill.
5) Computer Graphics, Prentice – Donald Hearn, M. Pauline Baker - Hall of India Pvt. Limited, NewDelhi.

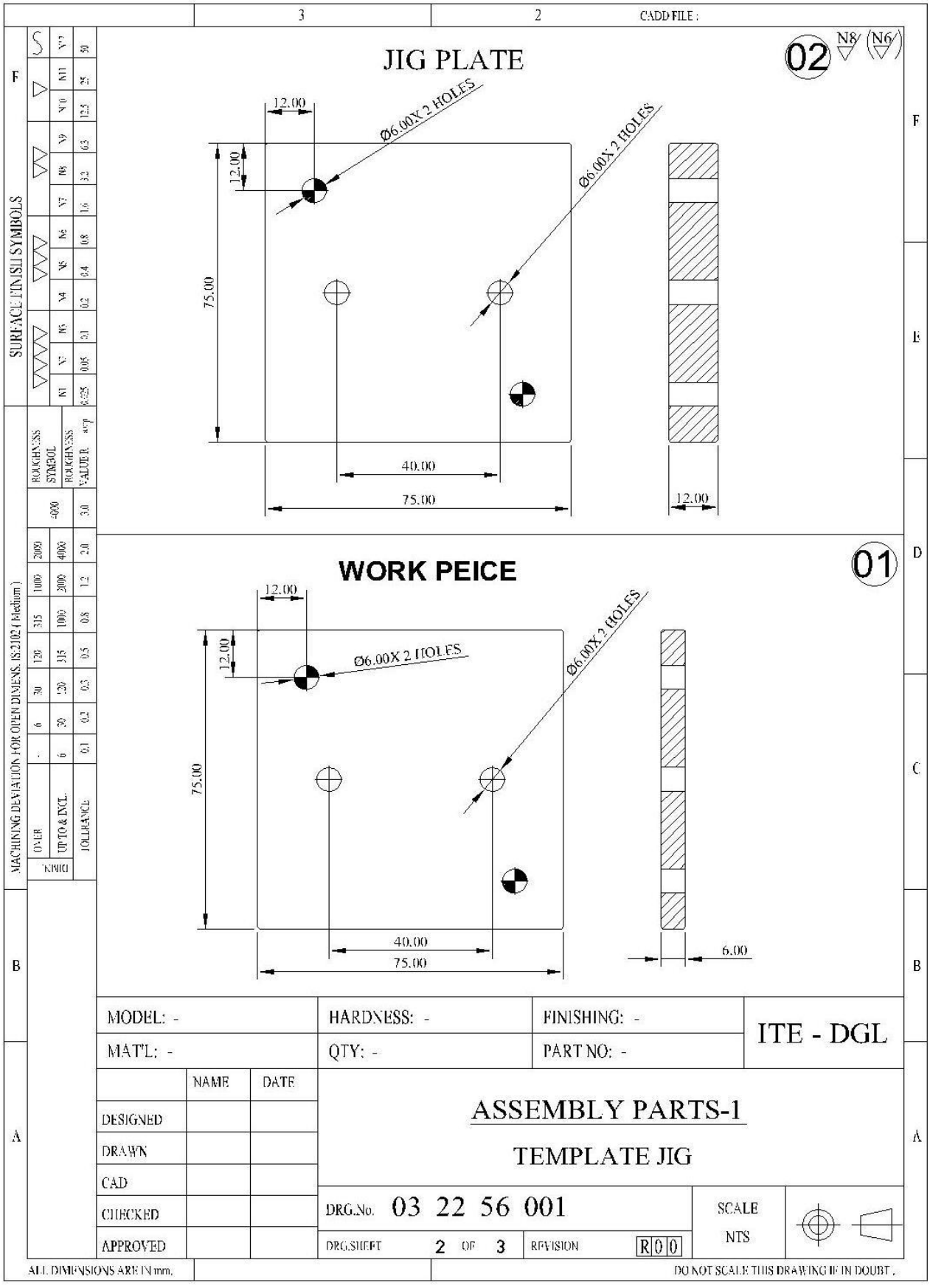
LIST OF EQUIPMENT:

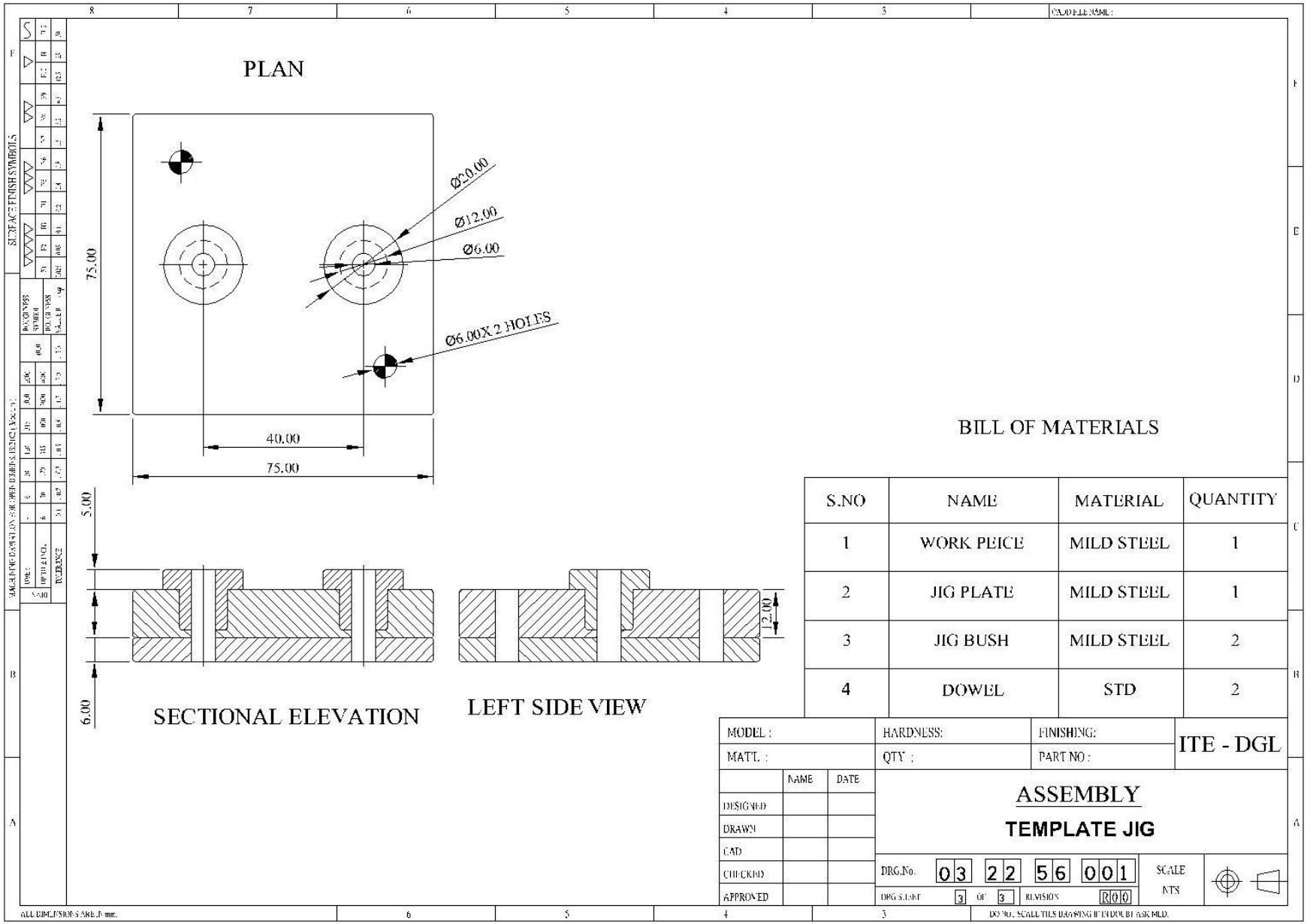
1. Personal computer (With latest processor to suit Auto CAD) – 30 No's
2. MS Windows OS – 30 No's
3. AutoCAD software (release 2000 or above) – 30 Users

Tool Drawing

Exercise – 9 Template Jig




CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. (IS:2102-1 (Medium))
ROUGHNESS SYMBOL
ROUGHNESS VALUE IN µm
TOLERANCE
OVER
UP TO & INCL.
JIG PLATE
02
N8
N6
12.00
Ø6.00X 2 HOLES
12.00
75.00
40.00
75.00
12.00
WORK PEICE
01
12.00
Ø6.00X 2 HOLES
12.00
75.00
40.00
75.00
6.00
MODEL: -
HARDNESS: -
FINISHING: -
MAT'L: -
QTY: -
PART NO: -
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
TEMPLATE JIG
DRG.No. 03 22 56 001
DRG.SHEET 2 OF 3
REVISION R 0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.



BILL OF MATERIALS

S.NO	NAME	MATERIAL	QUANTITY
1	WORK PEICE	MILD STEEL	1
2	JIG PLATE	MILD STEEL	1
3	JIG BUSH	MILD STEEL	2
4	DOWEL	STD	2

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

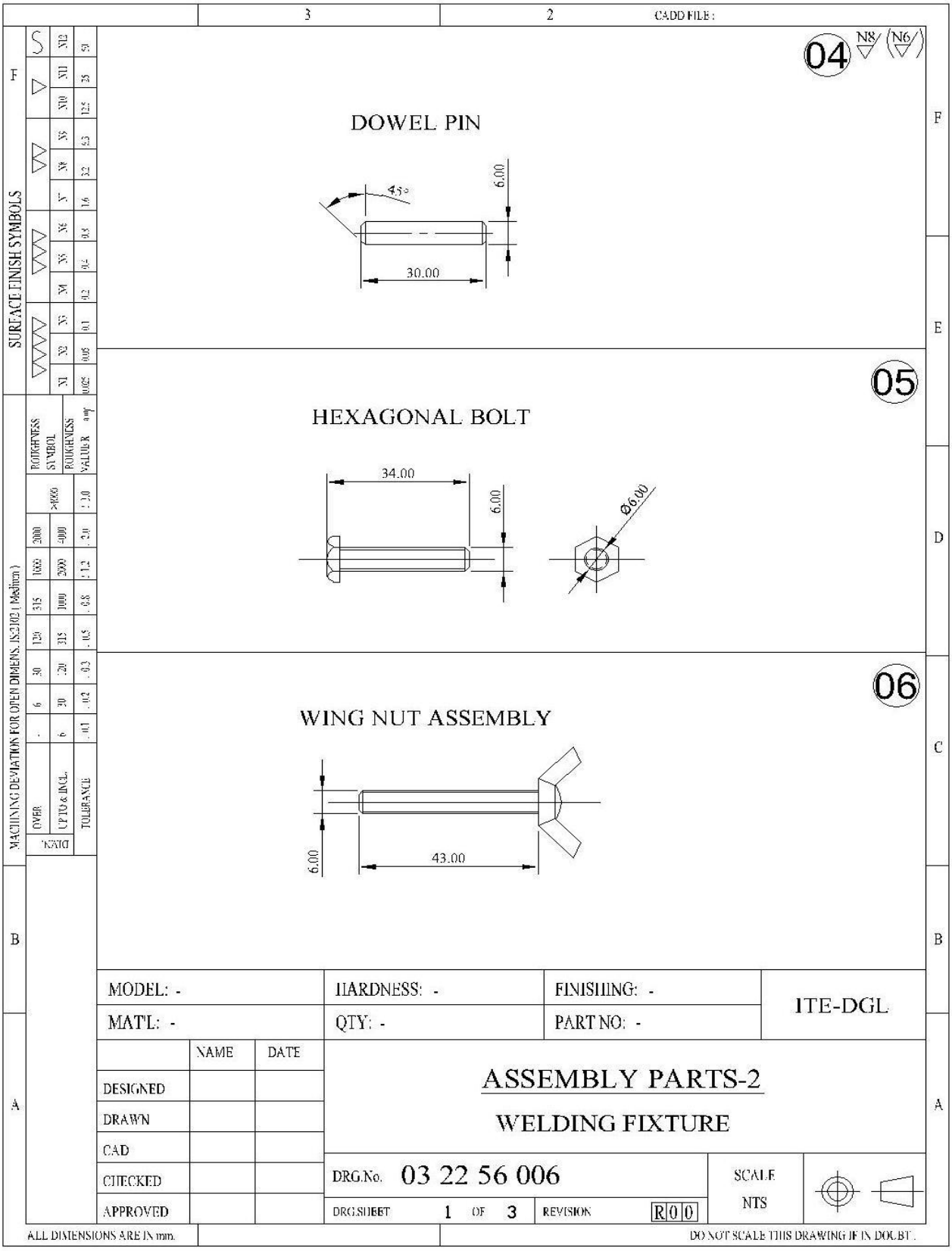
TEMPLATE JIG

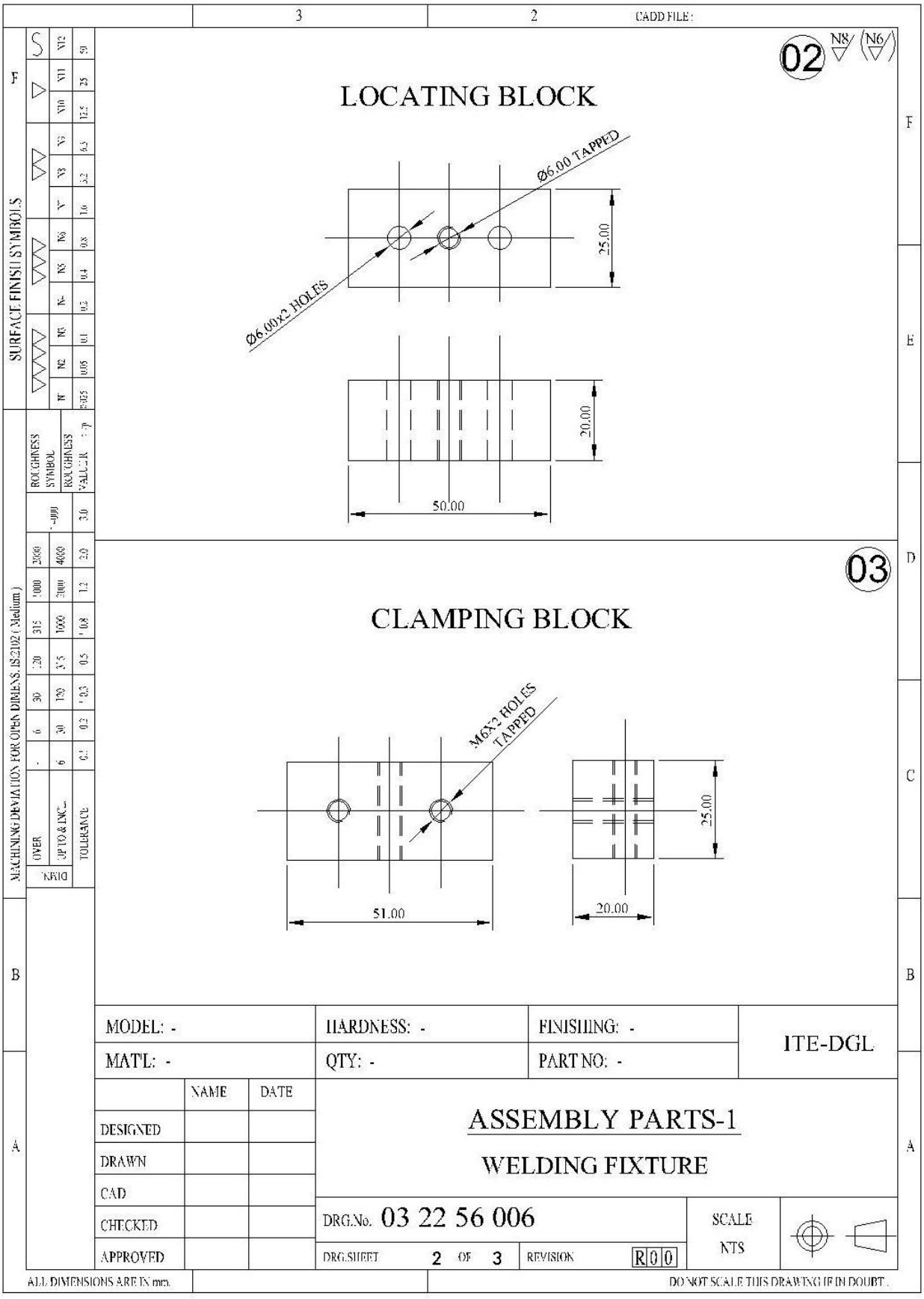
DRG.No. 03 22 56 001

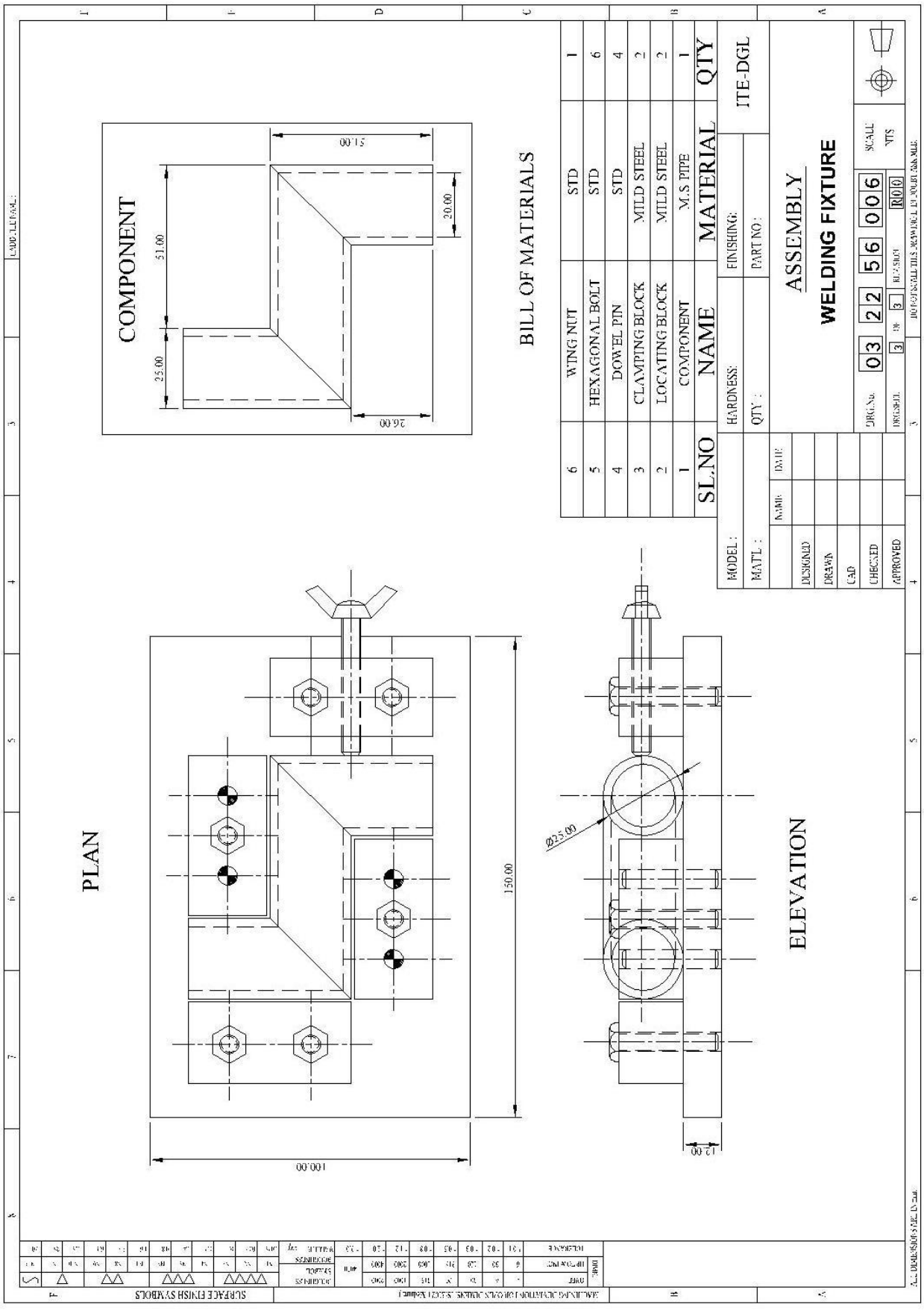
DRG SHEET 3 OF 3 REVISION R00

SCALE NTS

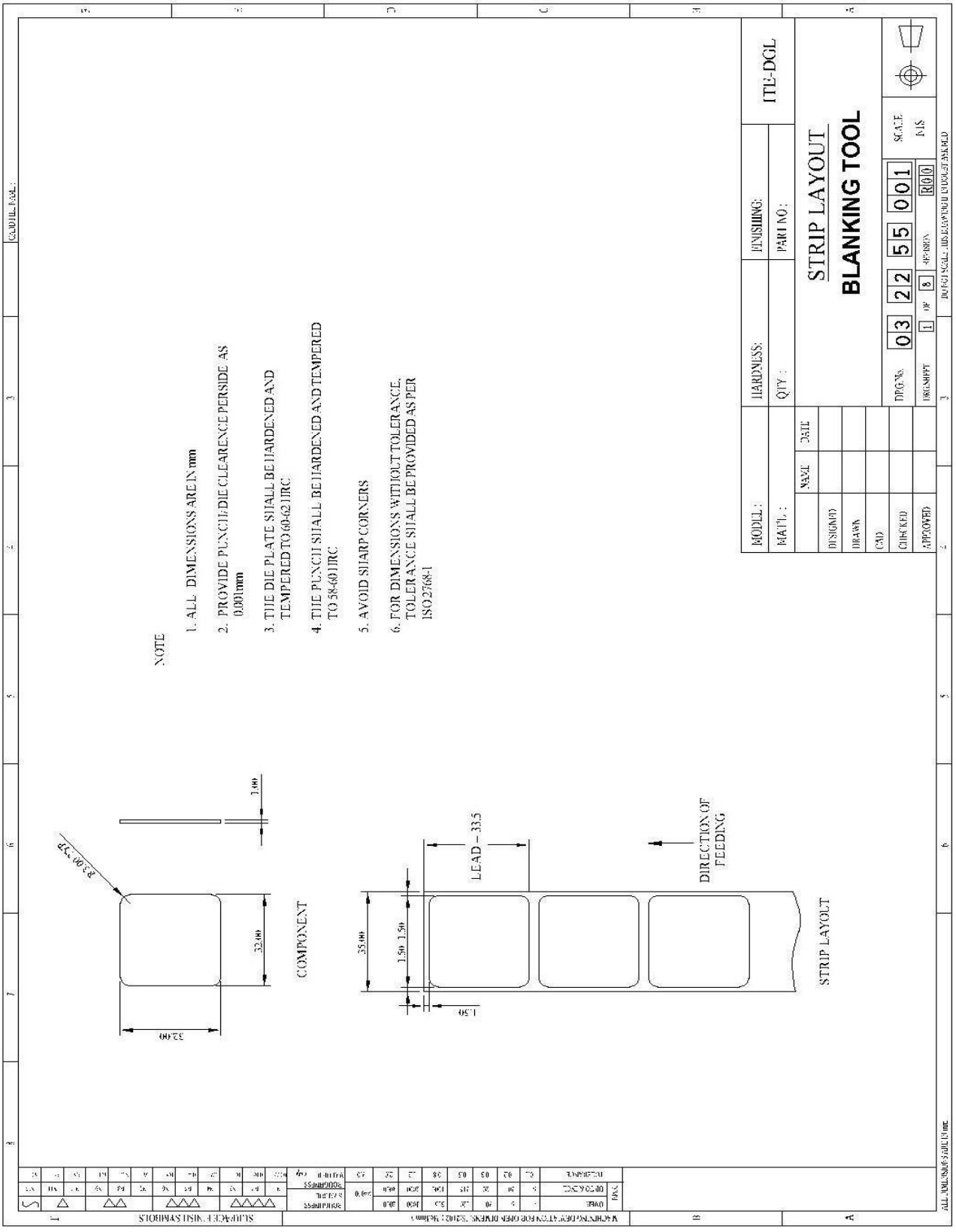
Exercise –10 Welding Fixture

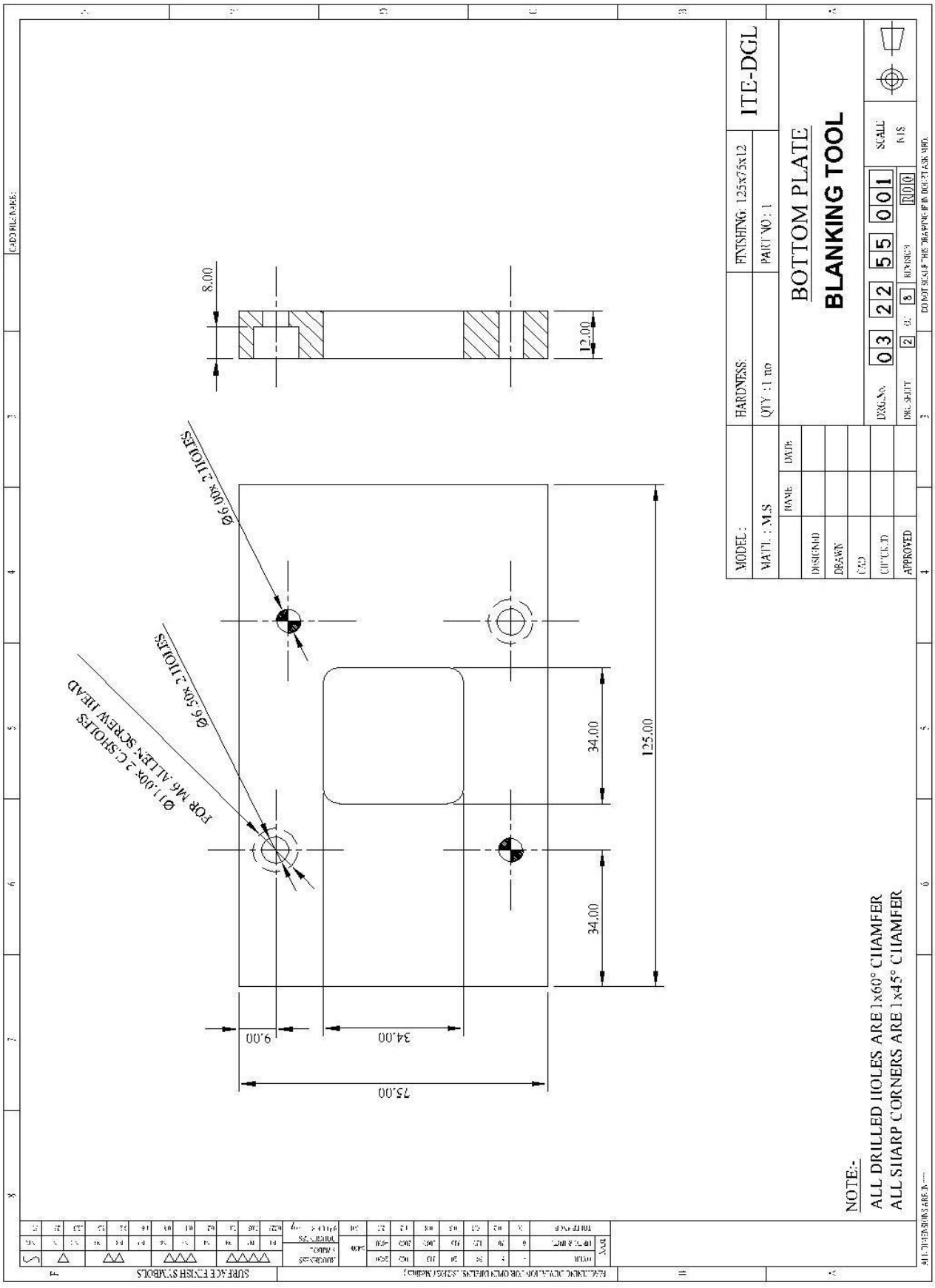


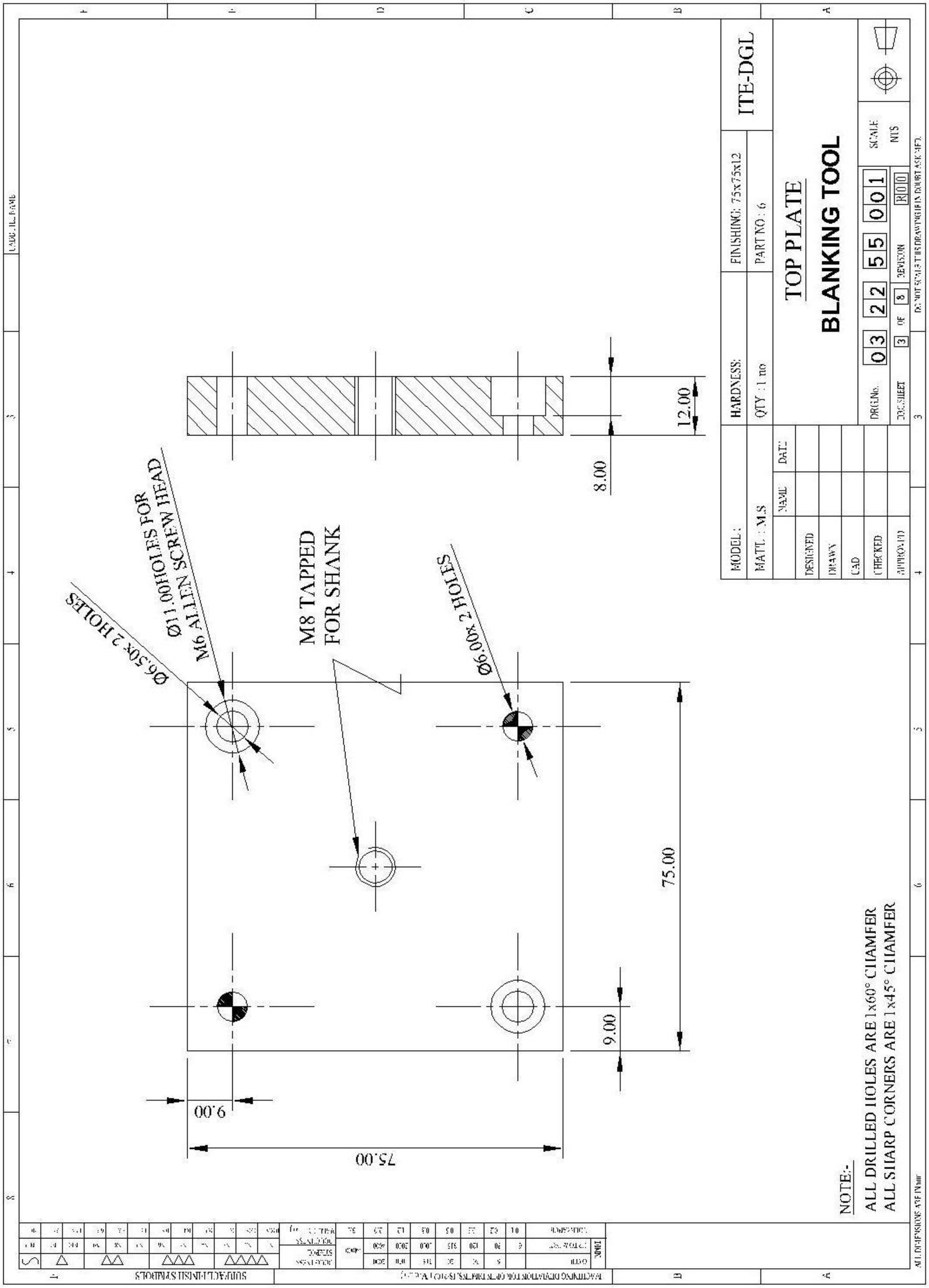

CADD FILE :
02
N8
N6
LOCATING BLOCK
Ø6.00 TAPPED
Ø6.00x2 HOLES
25.00
20.00
50.00
03
CLAMPING BLOCK
M6X2 HOLES TAPPED
25.00
51.00
20.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
ITE-DGL
MATL: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
WELDING FIXTURE
DRG.No. 03 22 56 006
SCALE NTS
DRG.SHEET 2 OF 3
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

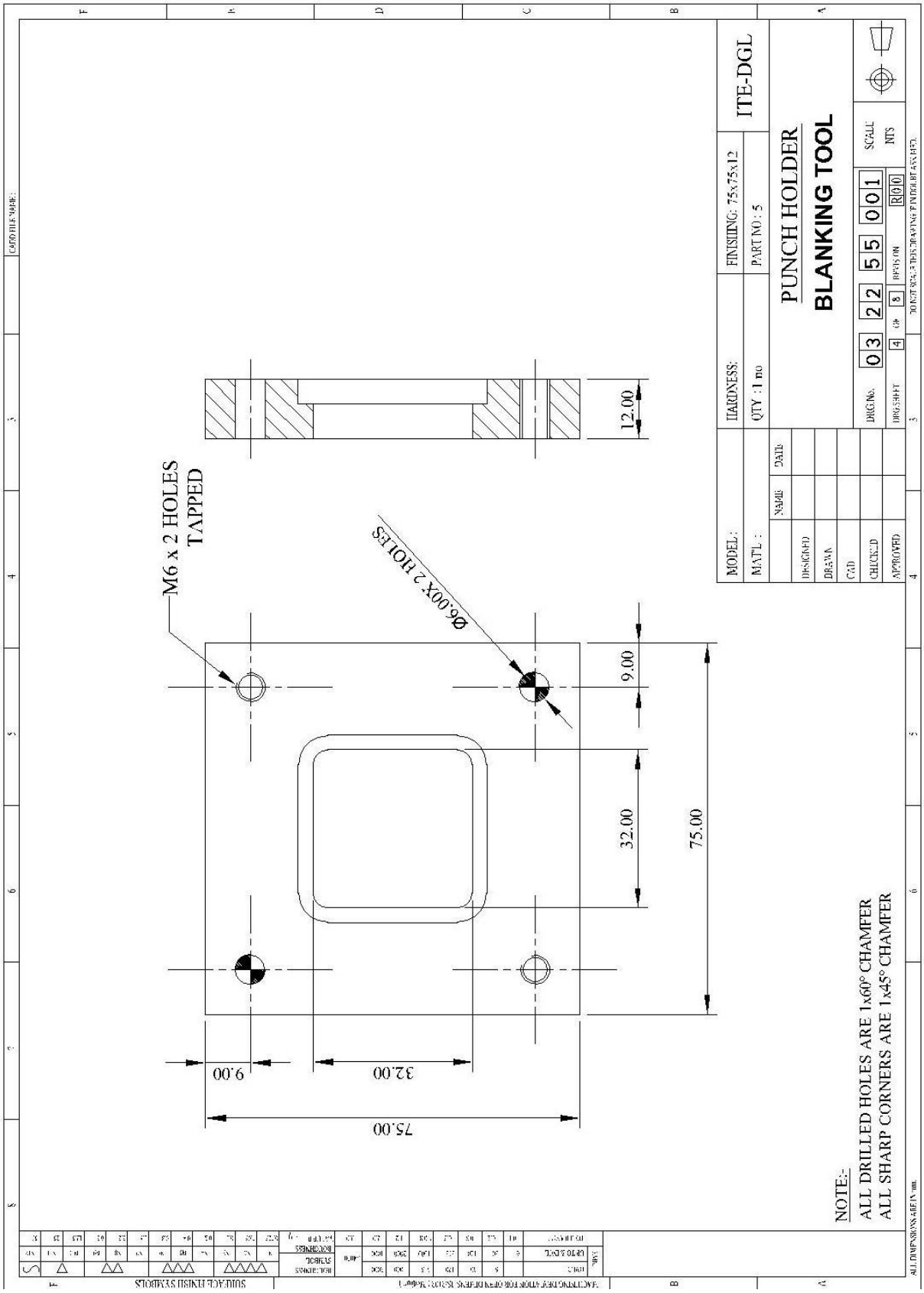

COMPONENT
51.00
25.00
26.00
20.00
BILL OF MATERIALS
SL.NO
NAME
MATERIAL
QTY
1
COMPONENT
M.S PIPE
1
2
LOCATING BLOCK
MILD STEEL
2
3
CLAMPING BLOCK
MILD STEEL
2
4
DOWEL PIN
STD
4
5
HEXAGONAL BOLT
STD
6
6
WING NUT
STD
1
ASSEMBLY
WELDING FIXTURE
ITE-DGL
PLAN
ELEVATION
100.00
150.00
Ø25.00
12.00

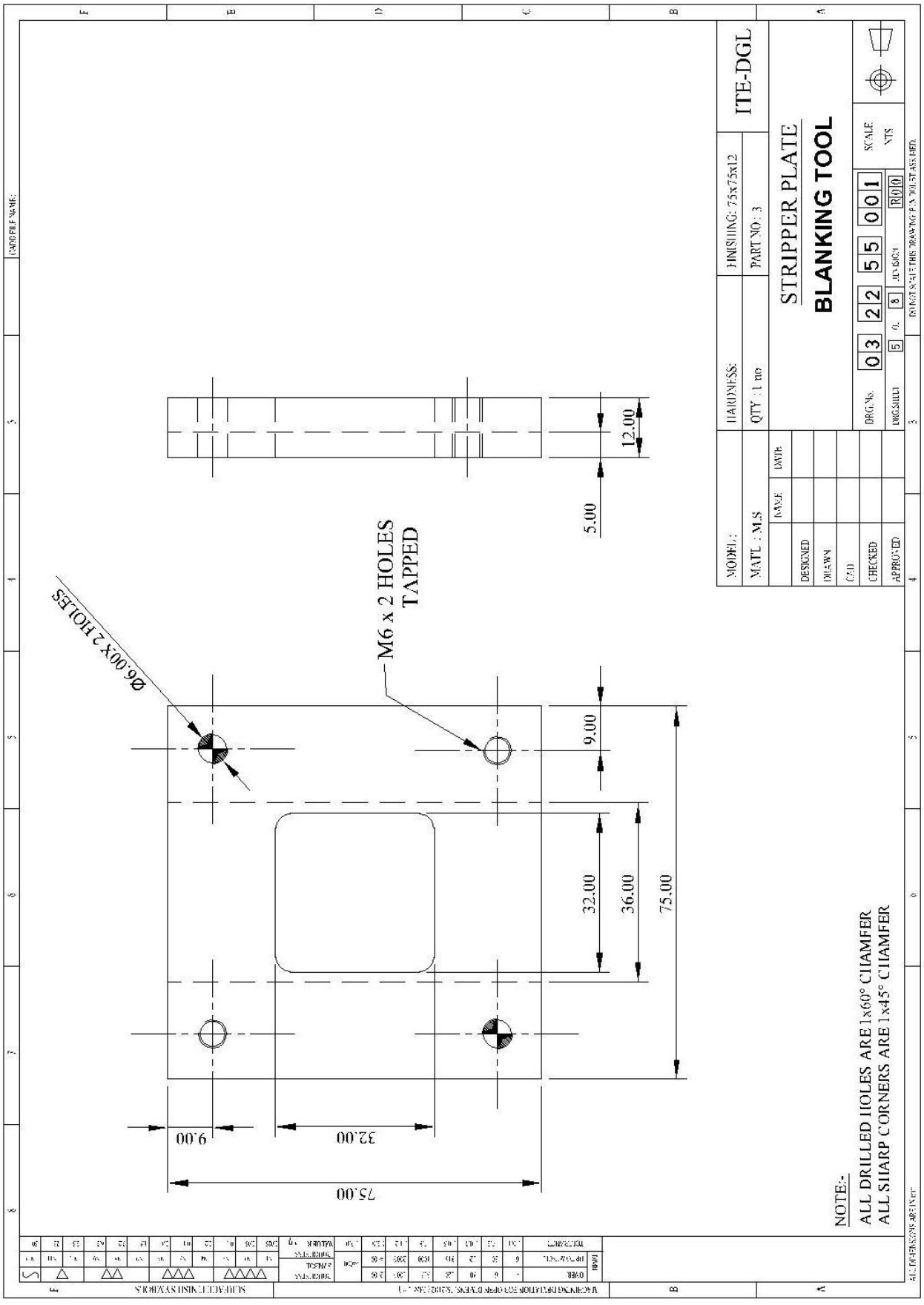
Exercise- 11 Blanking Tool – Drop through type

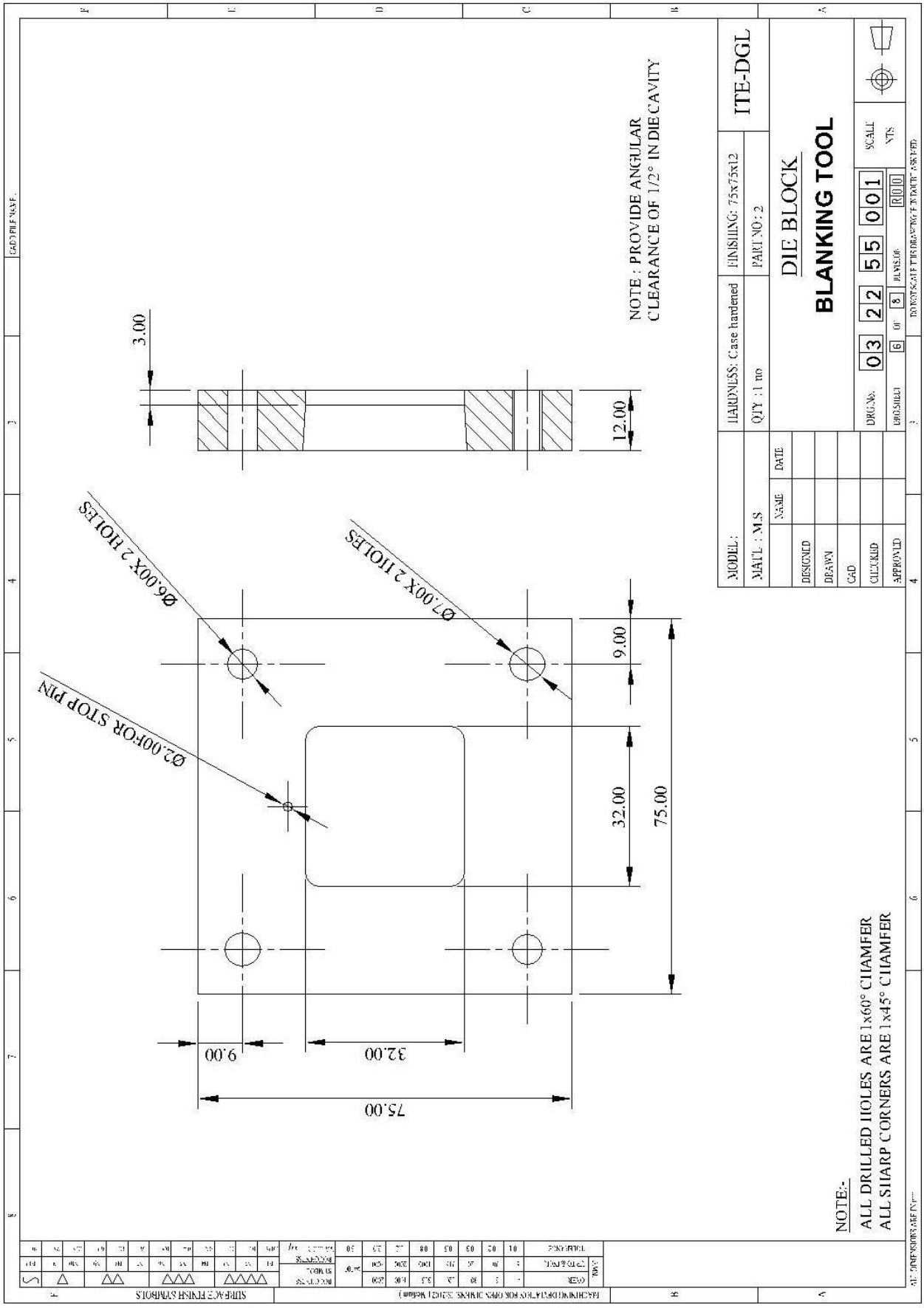


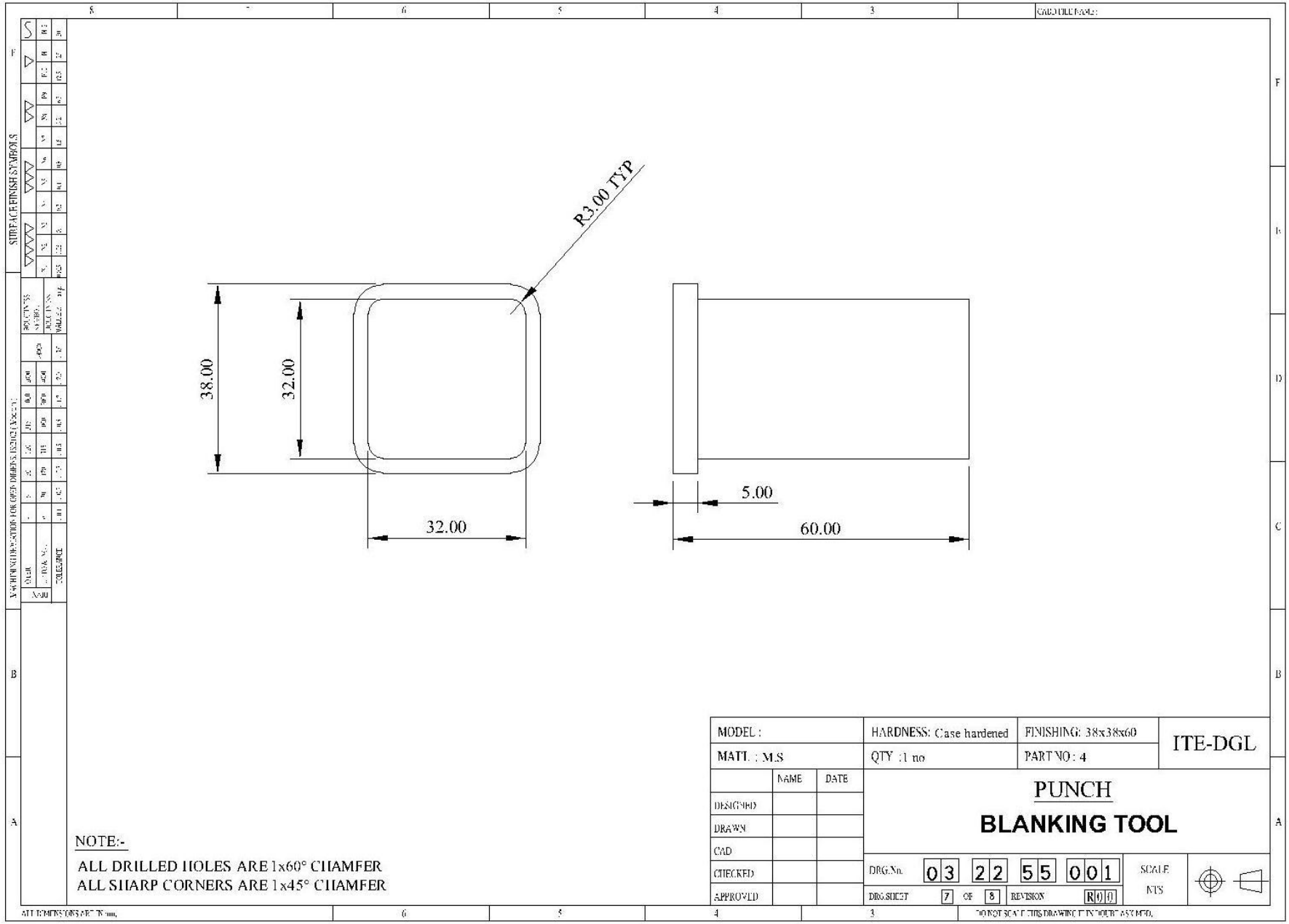

8.00
12.00
Ø 9.00x 2 HOLES
Ø6.50x 2 HOLES
Ø11.00x 2 C.SHOLES
FOR M6 ALLEN SCREW HEAD
34.00
125.00
34.00
9.00
34.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
MATL : M.S
HARDNESS
QTY : 1 no
FINISHING: 125x75x12
PART NO : 1
ITE-DGL
BOTTOM PLATE
BLANKING TOOL
DRG.NO. 03 22 55 001
SCALE 1:1
DESIGNED
DRAWN
CHECKED
APPROVED
DO NOT SCALE THIS DRAWING

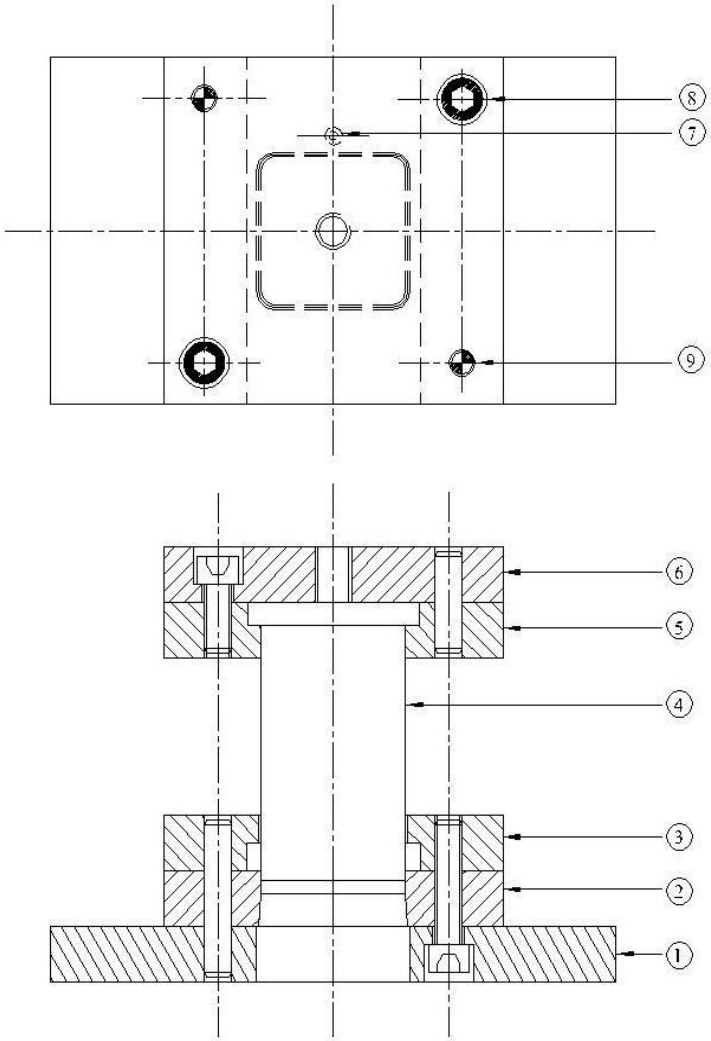

ITE-DGL
FINISHING: 75x75x12
PART NO : 6
HARDNESS:
QTY : 1 no
MODEL :
MATL : M.S
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP PLATE
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE
NTS
Ø6.50x 2 HOLES
Ø11.00HOLES FOR
M6 ALLEN SCREW HEAD
M8 TAPPED
FOR SHANK
Ø6.00x 2 HOLES
12.00
8.00
75.00
9.00
9.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


M6 x 2 HOLES TAPPED
Ø6.00X 2 HOLES
12.00
9.00
32.00
75.00
9.00
32.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
MATL :
HARDNESS:
QTY : 1 no
FINISHING: 75x75x12
PART NO : 5
ITE-DGL
PUNCH HOLDER
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE NTS


STRIPPER PLATE
BLANKING TOOL
ITE-DGL
MATL : M.S
QTY : 1 no
PART NO : 3
DRG No. 03 22 55 001
SCALE VTS
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
M6 x 2 HOLES TAPPED
Ø6.00x 2 HOLES
12.00
5.00
9.00
32.00
36.00
75.00
9.00
32.00
75.00


NOTE : PROVIDE ANGULAR
CLEARANCE OF 1/2° IN DIE CAVITY
3.00
12.00
Ø6.00X 2 HOLES
Ø7.00X 2 HOLES
Ø2.00FOR STOP PIN
9.00
32.00
75.00
9.00
32.00
75.00
MODEL :
MATL : M.S
HARDNESS: Case hardened
QTY : 1 no
FINISHING: 75x75x12
PART NO: 2
ITE-DGL
DIE BLOCK
BLANKING TOOL
NAME
DATE
DESIGNED
DRAWN
CaD
CHECKED
APPROVED
DRG.No. 03 22 55 001
SCALE
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


R3.00 TYP
38.00
32.00
32.00
5.00
60.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS: Case hardened
FINISHING: 38x38x60
ITE-DGL
MATL : M.S
QTY :1 no
PART NO : 4
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
PUNCH
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE NTS
DRG.SHEET 7 OF 8
REVISION R0 0



SECTIONAL ELEVATION

BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
9	Ø6 DOWEL	STD	4
8	M6 ALLEN SCREW	STD	4
7	STOP PIN	STD	1
6	TOP PLATE	M.S	1
5	PUNCH HOLDER	M.S	1
4	BLANKING PUNCH	M.S (CASE HARDENED)	1
3	STRIPPER PLATE	M.S	1
2	DIE BLOCK	M.S (CASE HARDENED)	1
1	BOTTOM PLATE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

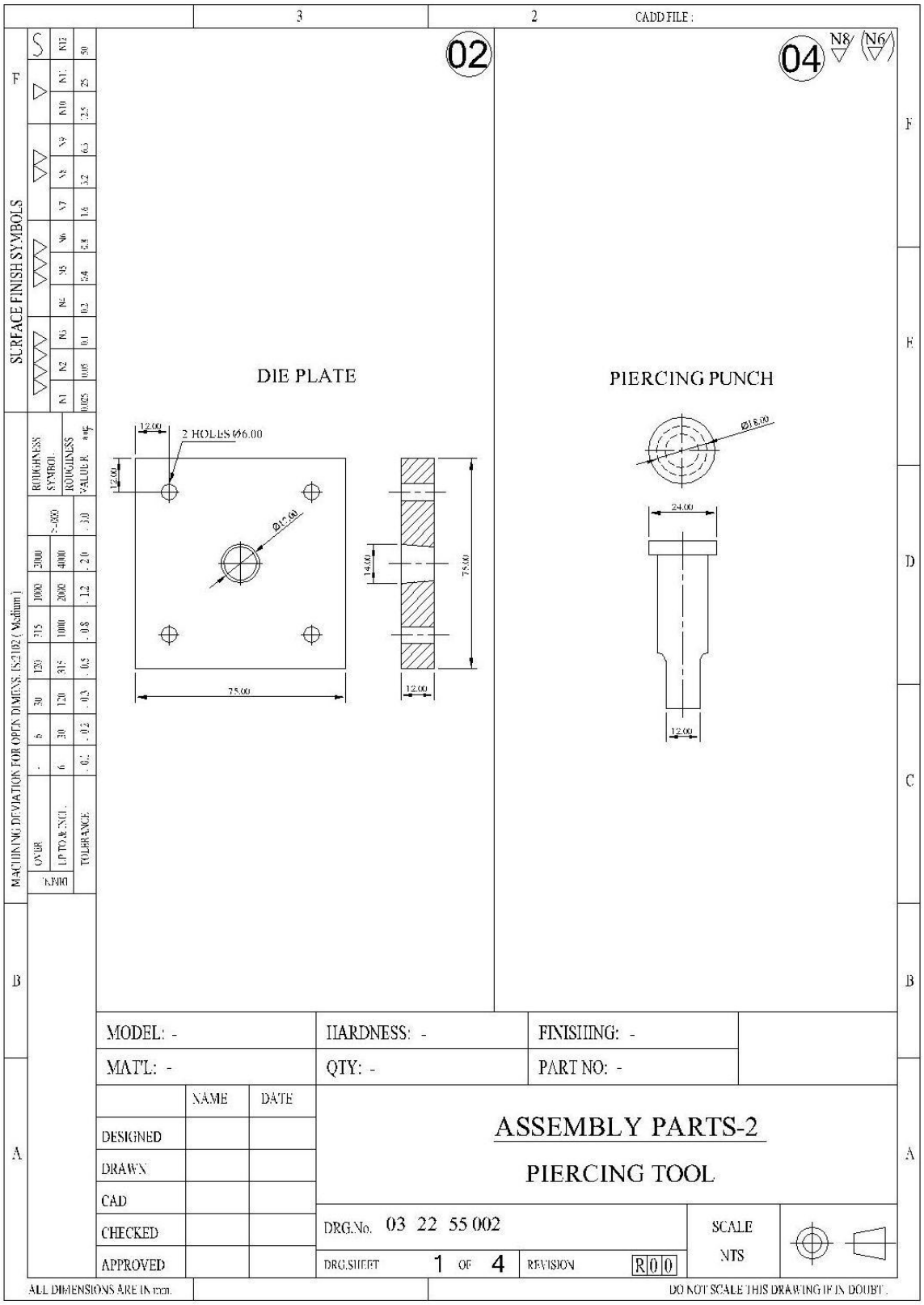
BLANKING TOOL

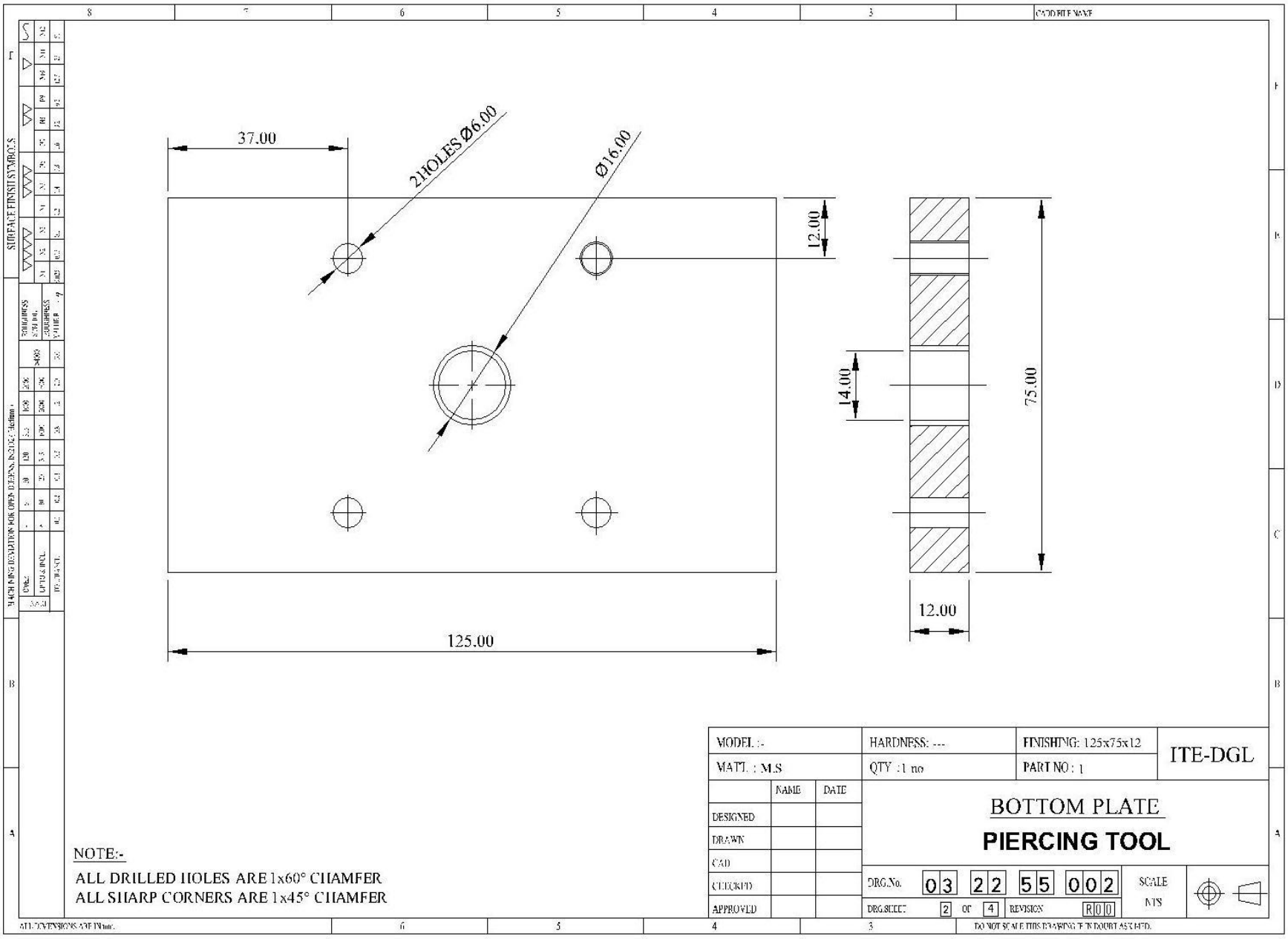
DRG.No. 03 22 55 001 | SCALE NTS

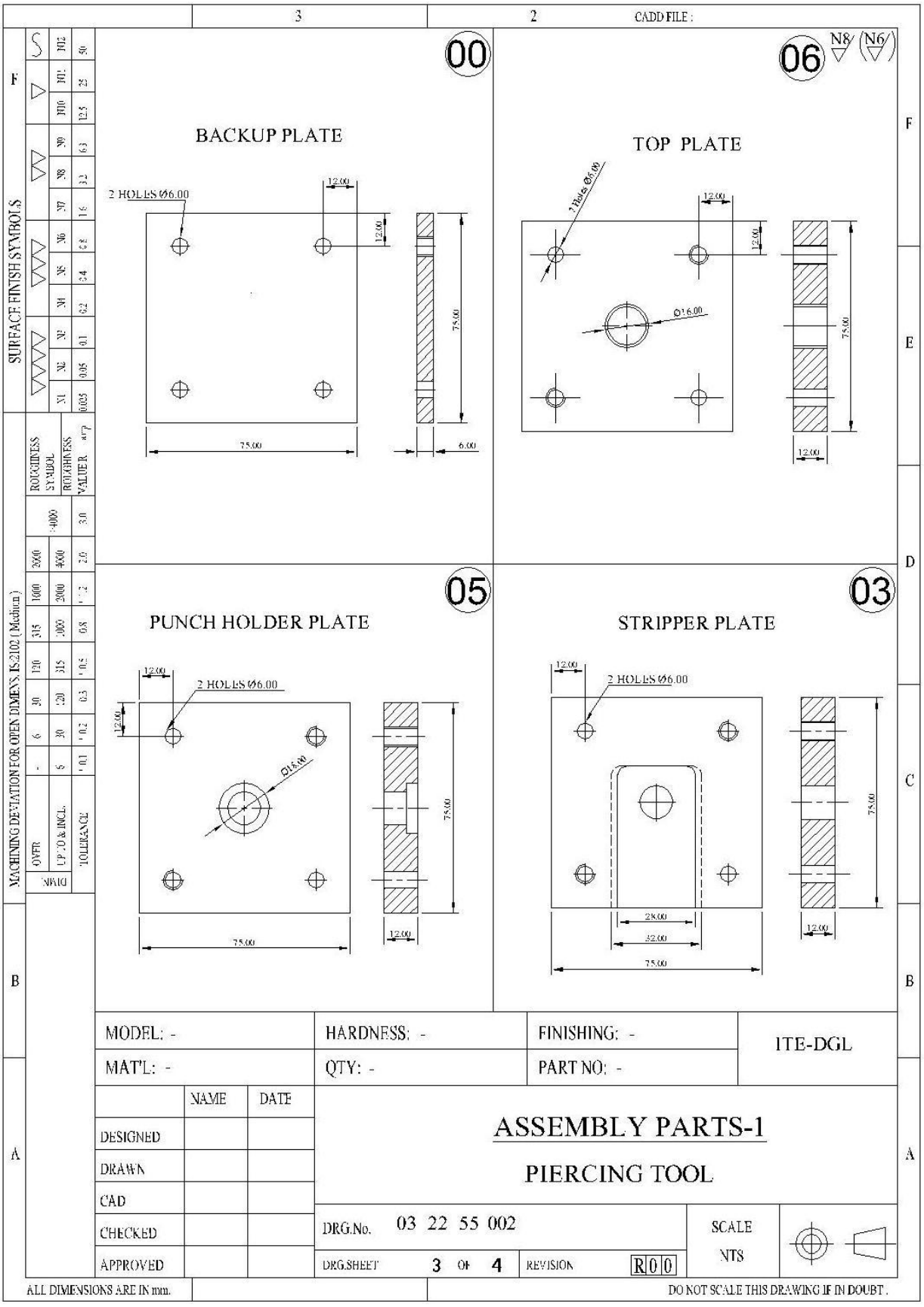
DRG.SHEET 8 OF 8 | REVISION R00

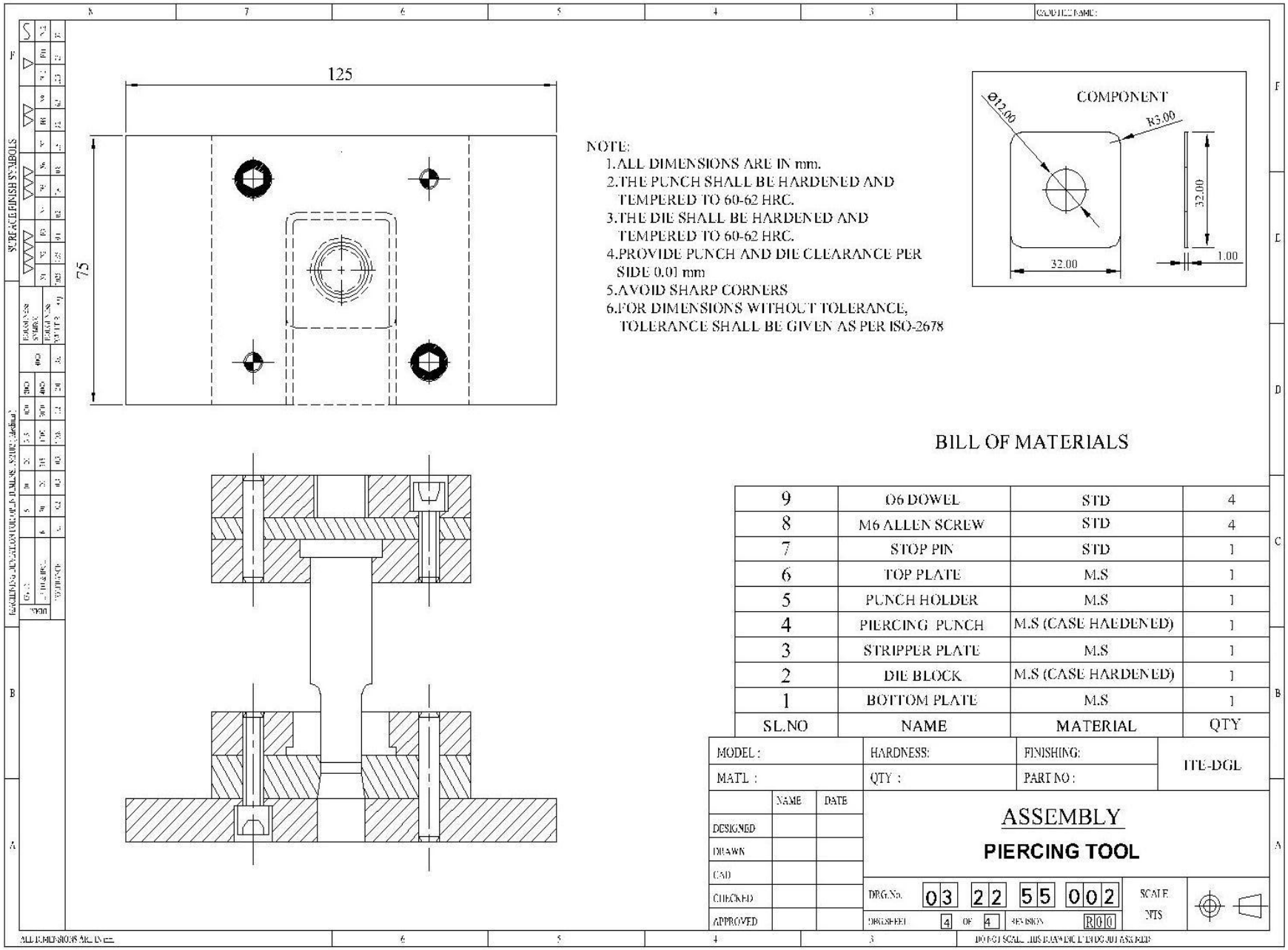
ALL DIMENSIONS ARE IN mm. | DO NOT SCALE THIS DRAWING IF PLOTTED/RESIZED.

Exercise-11 Piercing Tool

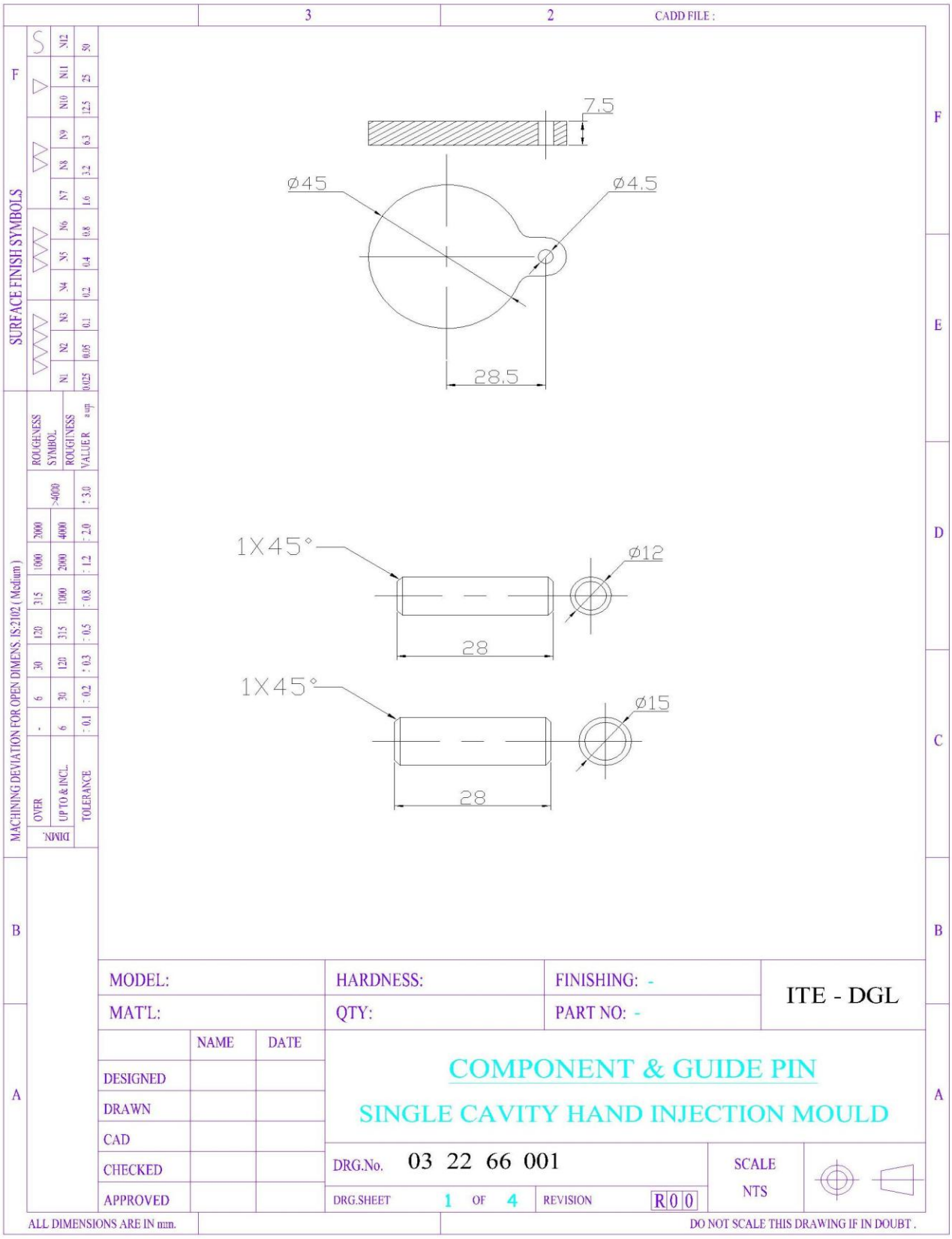


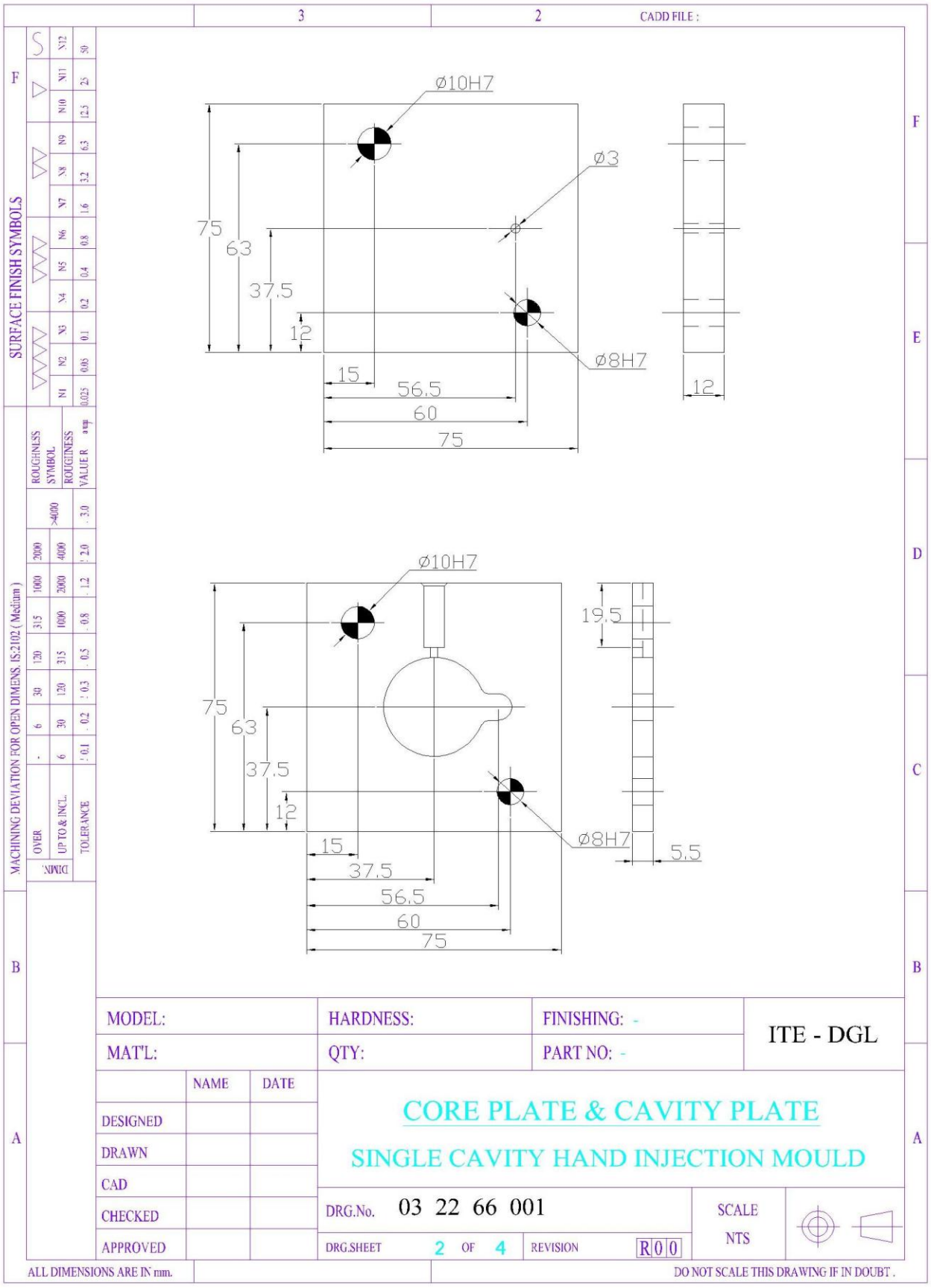

37.00
2HOLES Ø6.00
Ø16.00
12.00
14.00
75.00
12.00
125.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 125x75x12
ITE-DGL
MATL : M.S
QTY :1 no
PART NO : 1
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BOTTOM PLATE
PIERCING TOOL
DRG.No. 03 22 55 002
SCALE
NTS
DRG.SHEET 2 OF 4
REVISION R00

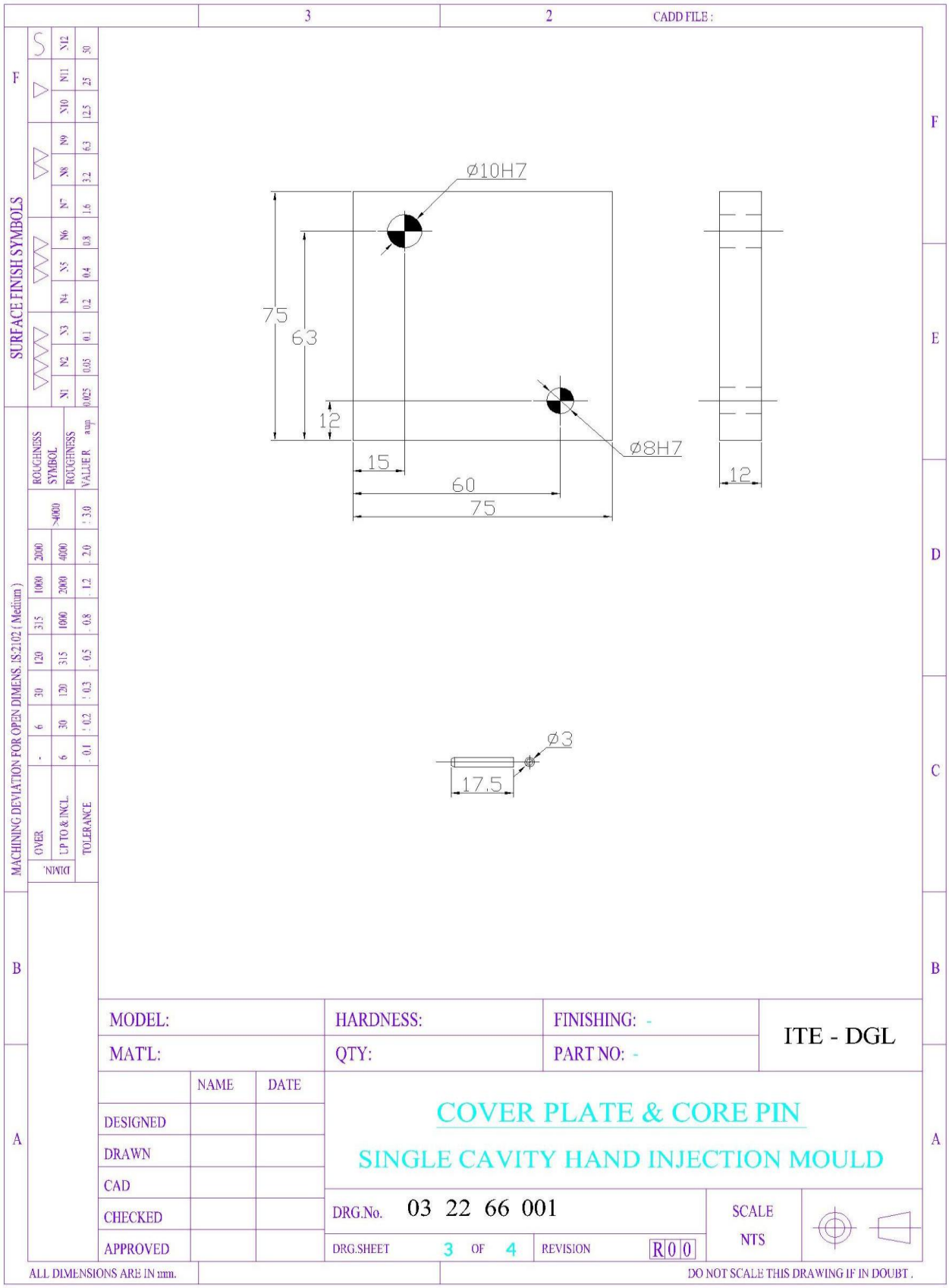

CADD FILE :
00
BACKUP PLATE
2 HOLES Ø6.00
12.00
75.00
6.00
06
N8
N6
TOP PLATE
Ø16.00
05
PUNCH HOLDER PLATE
Ø15.00
03
STRIPPER PLATE
28.00
32.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
ITE-DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
PIERCING TOOL
DRG.No. 03 22 55 002
SCALE NTS
DRG.SHEET 3 OF 4
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

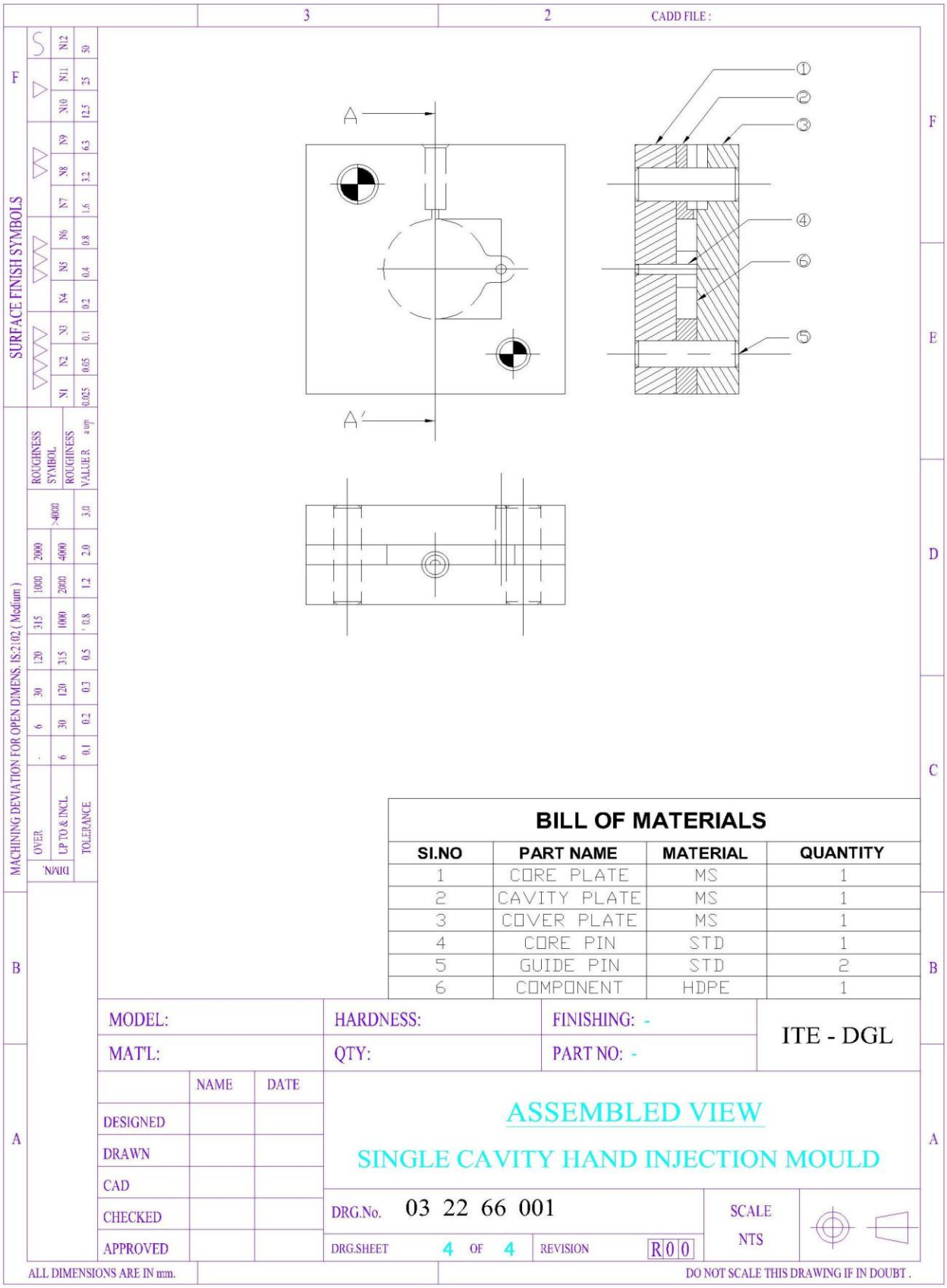

125
75
COMPONENT
Ø12.00
R5.00
32.00
32.00
1.00
NOTE:
1.ALL DIMENSIONS ARE IN mm.
2.THE PUNCH SHALL BE HARDENED AND TEMPERED TO 60-62 HRC.
3.THE DIE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC.
4.PROVIDE PUNCH AND DIE CLEARANCE PER SIDE 0.01 mm
5.AVOID SHARP CORNERS
6.FOR DIMENSIONS WITHOUT TOLERANCE, TOLERANCE SHALL BE GIVEN AS PER ISO-2678
BILL OF MATERIALS
9 | Ø6 DOWEL | STD | 4
8 | M6 ALLEN SCREW | STD | 4
7 | STOP PIN | STD | 1
6 | TOP PLATE | M.S | 1
5 | PUNCH HOLDER | M.S | 1
4 | PIERCING PUNCH | M.S (CASE HAEDENED) | 1
3 | STRIPPER PLATE | M.S | 1
2 | DIE BLOCK | M.S (CASE HARDENED) | 1
1 | BOTTOM PLATE | M.S | 1
SL.NO | NAME | MATERIAL | QTY
MODEL :
HARDNESS:
FINISHING:
ITE-DGL
MATL :
QTY :
PART NO :
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY
PIERCING TOOL
DRG.No. 03 22 55 002
SCALE NTS
DRG.SHEET 4 OF 4
REVISION R00

Exercise –13 Single Cavity Injection Mould




3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
Ø10H7
Ø3
Ø8H7
75
63
37.5
12
15
56.5
60
75
12
19.5
5.5
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
CORE PLATE & CAVITY PLATE
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
SCALE NTS
DRG.SHEET 2 OF 4
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a µm
Ø10H7
Ø8H7
75
63
12
15
60
75
12
Ø3
17.5
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
COVER PLATE & CORE PIN
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
DRG.SHEET 3 OF 4
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE:R a in μm
TOLERANCE
OVER
UP TO & INCL.
DIMN.
A
A'
①
②
③
④
⑤
⑥
BILL OF MATERIALS
SI.NO | PART NAME | MATERIAL | QUANTITY
1 | CORE PLATE | MS | 1
2 | CAVITY PLATE | MS | 1
3 | COVER PLATE | MS | 1
4 | CORE PIN | STD | 1
5 | GUIDE PIN | STD | 2
6 | COMPONENT | HDPE | 1
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLED VIEW
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
SCALE NTS
DRG.SHEET 4 OF 4
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

Board of Examination

Part A (I to IV units)

One Mark question contain - (1 x 10) = 10 Marks

Part B – V Unit

1. Assembled view of a given drawing - = 45 Marks
   (2 Views only)
   a) Question from Machine drawing
   or
   b) Question from Tool Drawing
2. Bill of Materials, Dimensioning, Notes = 15 Marks

Viva voce - = 5 Marks

Total = 75 Marks

Note to the examiner:

Part A

- Answer any 10 questions out of 15 questions.
- Fifteen questions should cover the complete syllabus (UNIT I to IV)

Part-B

- Answer should be evaluated from the print out for the Part-B questions
- Examiner should set the question paper to cover the complete syllabus of Unit-V.
- Examiner has to ask the student to answer any one question from the lot of 13 drawings with either or choice as detailed above.
- Examiner has to set the no. of questions minimum 13 , even one batch of students contains less than 13.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

32245 – MECHANICAL MATERIAL TESTING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32245
Semester : IV semester
Subject title : **Mechanical Material Testing Practical**

Scheme of Instruction and Examination:

No. of Weeks per Semester : **15 Weeks**

Subject	Instruction		Examination			
Mechanical Material Testing Practical	Hours/Week	Hours/Semester	Assessment Marks			Duration (Hrs)
	4	60	Internal	Board Exam	Total	
			25	75	100	3

OBJECTIVES

The objective of this course is to make the Student:

- Able to determine various strengths of Different Materials.
- To calculate the Young's modulus and Shear modulus of the given material.
- To conduct Bend Test using the given specimen.
- To differentiate hardness and toughness of the given Ductile and Brittle Materials.
- To detect cracks on the given specimen
- To handle Rockwell & Brinell hardness tester to determine the Hardness of the given material.
- To observe the microstructure of ferrous and non ferrous metal using metallurgical microscope.

Detailed Syllabus

Part – A

1. Estimation of Tensile Strength of the Ductile material –Mild steel
2. Estimation of Tensile Strength of Brittle material - Cast Iron
3. Estimation of compressive Strength of the following materials
   a) Ductile material (Mild Steel or Al)
   b) Brittle material (Cast Iron or Bronze)
4. Estimation of shear strength of Mild steel specimen under (i) Single shear and (ii) Double shear condition
5. Estimation of Toughness of mild steel specimen using (i) Izod impact test (ii) Charpy impact test
6. Torsion test on mild steel – relation between torque and angle of twist, determination of shear modulus and determination of elastic constants for mild steel.
7. Determination of stiffness, modulus of rigidity, strain energy stored and shear stress by load deflection method on the coil springs.
8. Determination of Young's modulus of steel by deflection test.
9. Determine the ductility of the given specimen using Bend Test.

Part – B

10. Determination of hardness of Mild steel, copper, aluminium using Rockwell harness tester
11. Determination of hardness of OHNS and HCHCr using Rockwell harness tester.
12. Determination of hardness of Mild steel, copper, aluminium using Brinell hardness tester
13. Determination of hardness of OHNS and HCHCr using Brinell hardness tester.
14. Study of Metallurgical microscope and grain structures.
15. Preparation of specimen for study of micro structure of ferrous metals
16. Examine the micro structure of metal samples (i) Ferrous and (ii) Non- Ferrous.
17. Detection of Cracks in casting using Detection methods.
    i. Visual Inspection and ring test
    ii. Die penetrant test
18. Detection of Cracks in casting using Magnetic particle test

SCHEME OF EXAMINATION:

Part -A (1½ Hours) : 35 marks

Part -B (1½ Hours) : 35 marks

Viva-Voce : 0 5 marks

Total : 75 marks

SCHEME OF VALUATION:

Observation / Reading - 10 marks

Tabulation / Formula - 10 marks

Calculation & Result - 15 marks

DETAILS OF THE EQUIPMENTS

NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	SECOND
SEMESTER	IV
NAME OF THE LABORATORY	32245 MECHANICAL MATERIAL TESTING PRACTICAL

S.NO	LIST OF THE EQUIPMENTS	QUANTITY REQUIRED
1	Universal Testing Machine(UTM)	1
2	Rockwell Hardness Testing machine	1
3	Torsion testing machine	1
4	Defection testing machine	1
5	Impact test machine	1
6	Torsion testing arrangement	1
7	Shear testing machine	1
8	Brinell hardness testing machine	1
9	Metallurgical microscope	2
10	Metallurgical specimens	1set
11	Double disk polishing machine	1
12	Electromagnetic crack detector with its accessories	1

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

32246 – HYDRAULICS AND PNEUMATICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32246
Semester : IV
Subject Title : **HYDRAULICS AND PNEUMATICS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: **15 weeks**

SUBJECT	INTRODUCTION		EXAMINATION			
HYDRAULICS AND PNEUMATICS PRACTICAL	Hours/week	Hours/semester	Marks			Duration
			Internal	External	Total	
	4	60	25	75	100	3 Hrs

Objectives:

- Study Pneumatic system and its functioning
- Study Hydraulic system and its functioning
- Control operation of cylinders using metering in and metering out control
- Design and operate application oriented pneumatics circuits
- Design and operate application oriented hydraulic circuits
- Use special purpose valves such as shuttle valve and quick exhaust valve
- Compare the functioning of pneumatic and hydraulic systems
- Trouble shoot in pneumatic and hydraulic circuits

Note:

The students should be trained in Pneumatics and Hydraulics and all exercises should be completed. The students should maintain a Record Note book and submit the bonafide record for Board Practical Examination. Examination has to be conducted in Pneumatics and Hydraulics.

List of exercises in Pneumatic System:

1. Study of Pneumatic System and its elements.
2. Direct operation of a Single Acting Cylinder.
3. Direct operation of a Double Acting Cylinder.
4. Operation of a Single Acting Cylinder controlled from two different positions using Shuttle Valve.
5. Operation of a Double Acting Cylinder with quick return using quick exhaust valve.
6. Controlling the speed of a Double Acting Cylinder using metering –in and metering –out controls.
7. Automatic operation of a Double Acting Cylinder in single cycle using limit switch and memory valve.

List of exercises in Hydraulic System

1. Study of hydraulic System and its elements.
2. Direct operation of a Double Acting Cylinder.
3. Direct operation of a Hydraulic motor.
4. Controlling the speed of a Double Acting Cylinder using metering-in and metering-out type control.
5. Controlling the speed of hydraulic motor using metering-in and metering-out control
6. Sequencing of two cylinders using Sequence Valve.

Board Examination

Evaluation

Scheme of Practical Examination

		MARKS
Pneumatics : Any one exercise	Duration : 1 ½ HRS	35
• Pneumatic Circuit	– 15 marks	
• Connection as per circuit	– 15 marks	
• Execution of circuit	– 5 marks	
Hydraulics : Any one exercise	Duration : 1 ½ HRS	35
• Hydraulic Circuit	– 15 marks	
• Connection as per circuit	– 15 marks	
• Execution of circuit	- 5 marks	
Viva-Voice :		05
Internal Assessment:		25
TOTAL:		100

Resources Required

1. Pneumatic system with necessary DCV, FCV and Actuators.
2. Hydraulic system with necessary DCV, FCV and Actuators.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

32247 – TOOL ROOM SPECIAL MACHINES PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL &DIE)
Course Code : 1220
Subject Code : 32247
Semester : IV
Subject Title : **TOOL ROOM SPECIAL MACHINES PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 15 weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration (Hrs)
			Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
TOOL ROOM SPECIAL MACHINES PRACTICAL	**6**	**90**	**25**	**75**	**100**	3

OBJECTIVES:

- Identify a milling machine and its parts
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder
- Identify Shaping machine and its parts
- Identify the tools and instruments
- Handle the different types of work holding devices
- Machine a component using different machine tools.
- Calculate the indexing for a work

Syllabus

1. Introduction to shaping machine and its parts
2. Introduction to milling machine and its parts.
3. Introduction to grinding machine and its parts
4. Introduction to work holding devices.
5. Types of cutter used in milling machine
6. Types of grinding wheels used in grinding machines
7. Setting of work, tools and cutters in shaping, milling and grinding machines
8. Operations performed in shaping, milling and grinding machine

EXERCISES:

1. Machine a cube by using shaping machine
2. Machine a square block from round rod using Milling machine
3. Machine a 'V' Block using Milling machine
4. Machine Groove cuts using Vertical Milling machine
5. Grind a plain surface using surface Grinder
6. Grind a cylindrical surface using Cylindrical Grinding machine
7. Grind a Progressive type Plug gauge using Cylindrical Grinding machine
8. Machine a Spur Gear using milling machine by Simple Indexing
9. Machine a Helical Gear using milling machine.
10. Grind a Facing Tool using Tool and Cutter Grinder

SCHEME OF EXAMINATION

Milling / Grinding/Shaping	: 70 marks
Viva-voce	: 05 marks
Total	: 75 marks

Note: Sketches enclosed

TOOL ROOM SPECIAL MACHINES PRACTICAL - SKETCHES

Time: 5Hrs/ Week

No of weeks: 15

Total Hrs: 75

Note: All dimensions in mm

Note to the faculty :-Last job of the raw material (MS Rod Ø32x33mm, MS Rod Ø25x98mm and

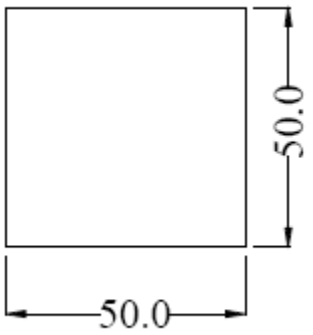
13x13x75 mm MS square rod) to be retain in student wise or batch wise(not more than 2 students)

.This may be verifiable at the time of Board Practical Examination by the external examiner

EXERCISE NO:1 SHAPING A PLAIN SURFACE

RAW MATERIAL SIZE:52 MM CI (OR) MS CUBE

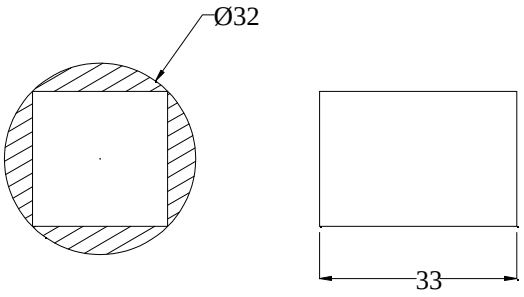
MANUFACTURE A SQUARE BLOCK USING SHAPING MACHINE.



ALL DIMENSIONS ARE IN mm

RAW MATERIAL SIZE:Ø32X33 mm MS ROUND

EXERCISE NO:2
MANUFACTURE A MAXIMUM SIZE SQUARE BLOCK
FROM GIVEN ROUND ROD USING MILLING MACHINE.

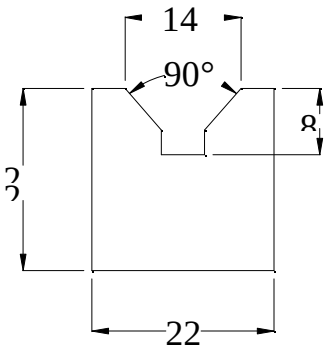


ALL DIMENSIONS ARE IN mm

EXERCISE NO:3

RAW MATERIAL SIZE:22 X33

MACHINE A V BLOCK BY USING MILLING MACHINE

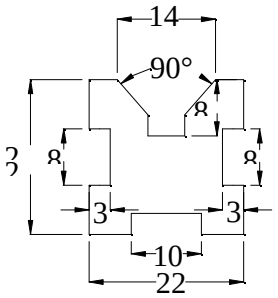


ALL DIMENSIONS ARE IN mm

EXERCISE NO:4 GROOVE MILLING

RAW MATERIAL SIZE:22X33

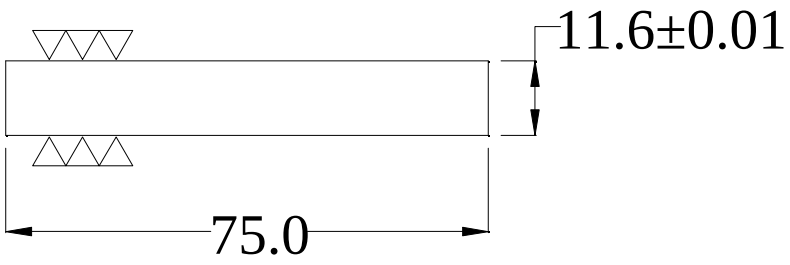
MACHINE THE REQUIRED GROOVES BY USING VERTICAL MILLING MACHINE



ALL DIMENSIONS ARE IN mm

EXERCISE NO:5 SURFACE GRINDING
RAW MATERIAL SIZE:75X50X12 mm MS FLAT

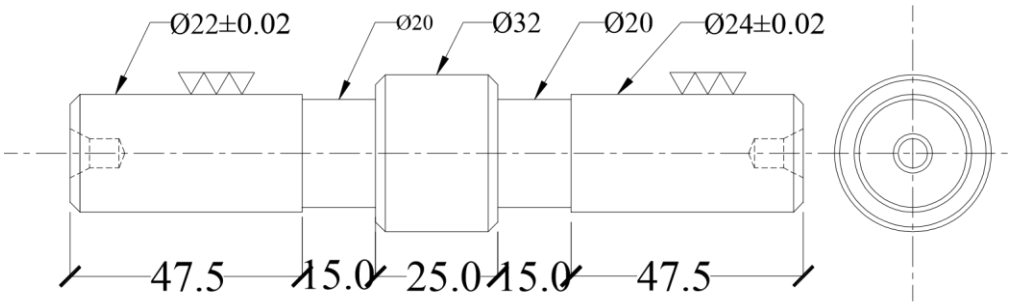
GRIND THE PLAIN SURFACE TO AN ACCURACY OF 0.01mm BY USING SURFACE GRINDING MACHINE.



ALL DIMENSIONS ARE IN mm

EXERCISENO:6 CYLINDRICAL GRINDING
RAW MATERIAL SIZE:Ø32X150 MM MS POLISH ROD

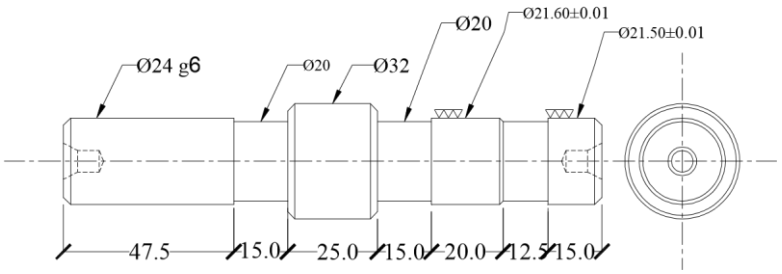
GRIND THE CYLINDRICAL COMPONENT TO AN ACCURACY OF 0.02MM BY USING CYLINDRICAL GRINDING MACHINE



ALL DIMENSIONS ARE IN mm

EXERCISE NO:7 CYLINDRICAL GRINDING
RAW MATERIAL SIZE:FINISHED WORKPIECE OF EX.NO:6

MANUFACTURE A PROGRESSIVE TYPE PLUG GAUGE BY USING CYLINDRICAL GRINDING

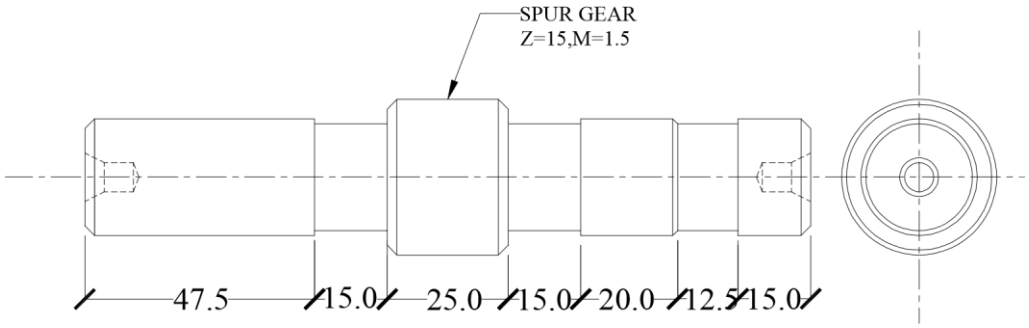


ALL DIMENSIONS ARE IN mm

EXERCISE NO:8 SPUR GEAR MILLING

RAW MATERIAL SIZE:FINISHED WORKPIECE OF EX.NO:7

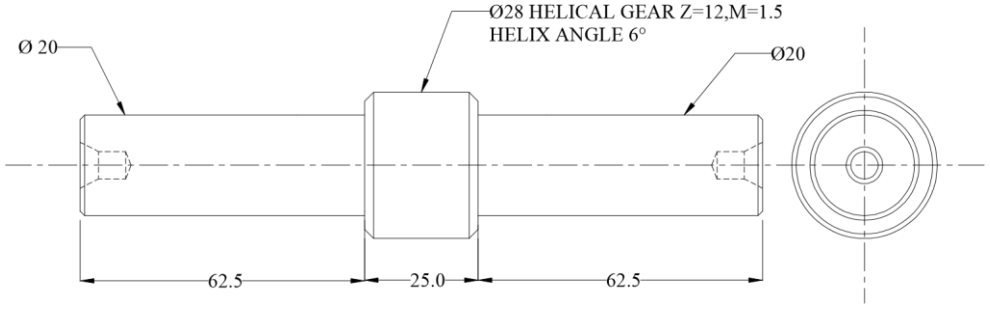
MACHINE A SPUR GEAR BY USING MILLING MACHINE



ALL DIMENSIONS ARE IN mm

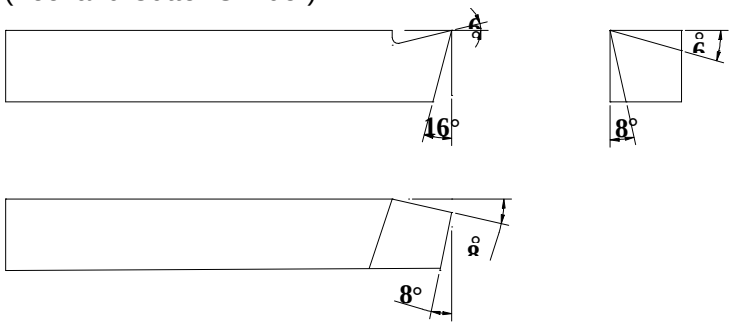
EXERCISE NO:9 HELICAL GEAR MILLING RAW MATERIAL SIZE:FINISHED WORKPIECE OF EX.NO:6

MACHINE A HELICAL GEAR BY USING MILLING MACHINE



TOOL AND CUTTER GRINDING

Exercise No:10- Facing Tool (Tool and Cutter Grinder)



Raw Material:13x13x75

LIST OF EQUIPMENTS MACHINES:

1. Vertical milling machine/ vertical milling attachment in Universal Milling Machine – 2 No's
2. Universal Milling Machine with indexing head- 2 Nos
3. Surface Grinding Machine (Horizontal) – 1 No
4. Cylindrical Grinding machine – 1 No
5. Tool and Cutter grinder – 1 No 6. Shaping machine –1 no

Equipments & Tools:

1. Milling Cutter (2 Module cutter) & accessories – complete sets
2. Milling Machine Handle and required accessories – 2 sets
3. Grinding wheel OD 150 mm , ID 1''(AA-65, K5, V8) – 2 No's
4. Grinding wheel OD 300 mm , ID 150mm(AA-56, K5, V8) – 1 No

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

32251 – JIGS, FIXTURES AND GAUGES

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : **Diploma in Mechanical Engineering (Tool & Die)**

Subject Code : 32251

Semester : V

Subject Title : **Jigs, Fixtures and Gauges**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 15 weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration (Hrs)
			Internal Assessment	Board Examination	Total	
JIGS, FIXTURES AND GUAGES	5	75	25	75	100	3

TOPICS AND ALLOCATION OF HOURS:

Unit No	Topics	Time Hours
Unit – I	Basics of Work Holding Devices	14
Unit – II	Clamping and Tool Guiding Elements	14
Unit – III	Principles of Jig Design	14
Unit – IV	Principles of Fixture Design	14
Unit – V	Gauges	14
	TEST & REVISION	05
	Total	**75**

Rationale:-

In the present competitive environment, elimination of non productive time in the processes is essential to improve productivity. For improving the productivity in the engineering industries various types of production tools Viz., Jigs, Fixtures, Gauges etc., are employed wherever necessary /possible. Hence thorough knowledge on the principles, construction and working principle of various Work holding devices and gauges is absolutely essential.

OBJECTIVES

- Identify the Difference between Jig & Fixtures
- Study the plane of movements
- Explain possible freedom of movement of job in a jig, fixtures
- Study locating of work piece in a jig, fixture
- To understand the construction of various types of Jigs and Fixtures
- Explain mounting of jig on a machine tool
- Explain mounting of fixtures on the machine tool
- Design jig and fixtures
- Design of plug and snap gauges

32251 JIGS, FIXTURES AND GUAGES

DETAILED SYLLABUS

Contents: Theory

Unit No.	Name of the Topic	Hours
I	**BASICS OF WORKHOLDING DEVICES:** **Work holding Concepts –** Basic Work holders, work holder purpose and function, General Considerations. **Jigs and Fixtures –** Introduction – Definition – Difference between Jigs and Fixtures – Advantages of Jigs and Fixtures. **Locating and supporting principles** - Location types, Degrees of freedom - 12 degrees of freedom. Location methods - 6 points location principle (or) 3-2-1 principle of location, concentric and Radial methods – Basic rules, position and number of locators, Redundant locators, Locational Tolerances, Fool proofing. **Locator Types** : **External** – Fixed locators, Integral locators, Commercial pin, Assembled locators, Pins, V Type, locating nests. Adjustable locators, Sight locators. **Internal** – Machined internal, Relieved, Diamond pins, Floating locating pin, conical locators, self adjusting locators, spring locating pins. Spring stop buttons. **Chip and burr problems**	14

II	**CLAMPING AND TOOL GUIDING ELEMENTS**: **CLAMPING**: Clamping principles – Tool forces, clamping forces, positioning clamps. Rigid Vs Elastic work holders. **Types of Clamps** – Strap clamp, screw clamp, cam action clamps, Toggle action clamps, wedge action clamps, latch clamps, rack and pinion clamps, specialty clamps. **Chucks –** Operations, Nomenclature. Lathe chucks – Solid Arbors and Mandrels. Split collet and bushing work holders, axial location, self actuating wedge cam and wedge roller work holders. **VISES** – Special jaws, independent jaws. **Non Mechanical Clamping –** Magnetic chucks, vacuum chucking, Electrostatic chuck. **Power Clamping** – Hydraulic and Pneumatic clamping. Multiple part clamping. **TOOL GUIDING ELEMENTS:** **Drill jig bushings and liners –** Selection, Bushing / liner installation, interference fit, chip clearance, accuracy and life. **Types of bushes –** Head less press fit bushes, Headed press fit bushes, Slip renewable and Slip fixed renewable bushings / liners, Headless press fit liners, Headed press fit liners, Oil groove bushings, Gun drill bushings, Special bushings. Bushings and liners for polymers, castable and soft material tooling. Template bushings, Rotary bushings. Drill bushing tips and accessories. Drill bush material and manufacture.	14
III	**PRINCIPLES OF JIG DESIGN** Introduction – General considerations – Machine considerations – Process considerations. Basic requirements of Drill jigs. **TYPES OF JIGS –** Template drill jigs, Plate jigs, Universal jigs, Leaf jig, Channel and Tumble box jigs, Indexing Jigs, Boring jigs, – Post jig – Pot jig. Miscellaneous drill jigs – Wooden drill jigs, Polymer Drill Jigs, modified vises, collet fixtures, self centering vises. **Jig design Example –** Plate Jig design example	14
IV	**PRINCIPLES OF FIXTURE DESIGN** **Introduction:** General Considerations, fixture cost, production capabilities, Production process, part considerations. **Types of fixtures** – Milling fixture, Lathe fixture, Grinding fixture, Broaching fixture, Assemble fixture, Inspection fixture, Boring fixture, Indexing fixture, welding fixture and sawing fixture. **Basic Design Characteristics that apply to** – Milling fixture, Lathe fixture, Grinding fixture, Boring fixture, Broaching fixture, welding fixture and sawing fixtures.	14

	Fixture Design - Standard fixture mounting, Relationship between fixture and cutting tool, Tool positioning, Relationship to locators, Cutter-setting devices, Step by step approach to fixture design. **Fixture design Example** – Plain Milling fixture. Fixture design for numerically controlled machine Tools	
V	**GAUGES** Introduction – limit gauges –Taylor's principle of limit gauging – Application of limit gauges – Gauging principles – Allocation of Gauge Tolerance – Bilateral system, Unilateral system, Gauge wear allowance, Gauge materials, Gauging policy. Types of Gauges – Commercial Gauges – Screw pitch gauges, Plug gauges, Ring gauges, Snap gauges, Flush pin gauges – IS specifications for gauges – Design of plug and Snap gauges.	14
	TEST & REVISION	**05**

Text Books:

1. Fundamentals of Tool Design, 6th Edition, 2010, SME Publication
2. Tool Design, Cyril Donaldson, Special Indian Edition, 2012, Tata Mc Graw Hill.
3. A Text Book of Production Engineering, P.C.Sharma, 2013, S.Chand & Co

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

32252 – PRESS TOOLS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32252
Semester : V
Subject Title : **PRESS TOOLS**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 15 weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration (Hrs)
			Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
PRESS TOOLS	**5**	**75**	**25**	**75**	**100**	**3**

Topics and Time allocation

UNIT	TOPIC	TIME (Hrs)
I	Press working fundamentals, operations, and machinery	14
II	Press & Press Tool Accessories And Types Of Die Construction	14
III	Bending And Forming Dies	14
IV	Drawing Dies And Dies For Secondary Operations	14
V	Advanced Press Tool Applications and Trouble shooting	14
	TEST & REVISION	05
	Total	75

Rationale:

Modern development of sheet metal industries require more understanding of production of sheet metal products and the machinery and tools involved in the production of the sheet metal products. This subject Press Tools will develop the basic knowledge on the essentials of the production of sheet metal products, the machinery and Tools involved in its production.

OBJECTIVES

The objective of this course is to make the Student:

- To understand the fundamentals of press working, to be familiar with the various press working operations and machines.
- To learn the safety in press working operations.
- To be familiar with the various press and press tool accessories
- To learn about the different types of Die construction.
- To know the various bending, forming and other miscellaneous press working operations.
- To learn about the construction and operation of the different bending dies.
- To be familiar with the various drawing and other related processes
- To know the construction and operating principle of drawing and combination dies.
- To know the basic concepts and the advantages of fine blanking process
- To learn the construction and working principle of various fine blanking dies.
- To learn about the concepts of SMED and quick die changes and its advantages in bringing down the press set up time.
- To learn to trouble shoot in various press tools.
- To be familiar with the specialised press tool applications.

32252 - PRESS TOOLS

DETAILED SYLLABUS

Contents: Theory

UNIT NO	Name of the Topic	Hours
I	**PRESS WORKING FUNDAMENTALS, OPERATIONS, AND MACHINERY** **Theory of cutting sheet metal:-** Analysis of cutting, clearance, cutting terminology, stages of cutting, penetration, burr. **Effects of clearance variation –** Secondary shear, large clearance, clearance selection, typical force curves. **Other cutting characteristic –** Dish distortion, spacing distortion, typical wear. **Forces for cutting sheet metal –** Cutting with square faces, cutting with shear, shear on punch, slug bending force, shear on die steel, stripping force. Stock and Stock layouts. **Press working operations-** Shearing, cutting off, parting, blanking, Punching, piercing, slotting, perforating, Notching, semi notching, lancing, parting, Trimming , slitting, shaving. Safety in press working. **Press working mechanism:- Presses according to their functions –** energy producing press, force producing presses, stroke controlled presses. **Press according to their energy supply –** Mechanical, hydraulic, Pneumatic, electromagnetic presses. **Presses according to their construction –** Solid or gap frame, open back inclinable, knee frame, horning, open end or end wheel. **Press according to their operation –** Single action, double action, triple action, multi slide press. Press actuating mechanisms. **Parts of press, Press operating parameters –** Tonnage, shut height, stroke, shut height adjustment, strokes per minute, die space. **Special purpose presses –** Dieing press, spotting press, press brake, gang punching press, automatic press, transfer press, multi slide machine.	14
II	**PRESS & PRESS TOOL ACCESSORIES AND TYPES OF DIE CONSTRUCTION** **Mechanical handling devices:- Feeding and reeling mechanisms for coiled sheet metal –** Reels and cradles (decoiler) , roll feeds and its types, hitch feeds**.** **Feeding mechanism for individual parts –** Hopper feeds, dial feeds, chutes, slides, magazine feeds, step feeds, special feeds. **Ejection mechanism –** Gravity, air, kicker, lifter, shovel, mechanical hand, ejection by next part. **Transfer mechanisms –** Conveyors, shuttle, turnover, turnaround, stacker, rails. **Types of die construction:-** Cut off, drop through, return type, compound, combination, continental, sub press, follow die, progressive die, transfer die, shuttle die. **Function and nomenclature of die components:-** Die, die set, die plate, punch, stripper plate, Die spring, rubber keeper, stripper bolt,	14

	solid stripper, knockout plate, hold down plate, pad plate, blank holder, pressure pin. Types of stock stop. **Attachment components –** Dowel, screw, key. **Miscellaneous components –** Heal, stop block, bolster plate, backing plate, pilot, gauges, insert, cams, hinges and rockers. **Commercially available die components –** Die sets, die set attachment devices, punches, die buttons, retainers, springs, fluid springs, die cushion and its types.	
III	**BENDING AND FORMING DIES:-** **Bending of sheet metal –** Bending theory, neutral axis, metal movement, spring back, methods of overcoming spring back. **Bending Operations –** Bending, flanging, hemming, curling, seaming, and corrugating. **Types of Bending dies (construction and working principle) –** V bending and its types, edge bending, u bending. Bending operations done using press brake. **Forming operations –** Embossing, bulging, crimping, tube forming. **Miscellaneous press working operations –** slugging, restrike or spank, extrude (holes), coining, hot trimming, cold trimming of die castings and plastic mouldings, riveting, burnishing or sizing, Ironing. **Forming dies –** Construction and working principle of solid form dies, pad form dies, curling dies, embossing dies, coining dies, swaging dies, bulging dies. **Assembly dies -** Riveting, tab stake, upset stake, crimping.	14
IV	**DRAWING DIES AND DIES FOR SECONDARY OPERATIONS** **Drawing operations –** Shallow drawing, deep drawing. **Analysis of cup drawing:- Stages of drawing -** Bending, straightening, friction, compression , tension, stretch forming. **Variables of drawing -** Bending and straightening variables, friction variables, compression variables, stretch forming variables, analysis of draw speed. **Draw dies &its construction and working principle –** Conventional draw die, redrawing die, reverse re drawing die, drawing of square or rectangular shapes. **Drawing with flexible tooling –** Marform process, Hydro form process, Hydro dynamic process, Verson- wheelon process. **Draw die details** – Blank holders blank holding pressure and its importance, air vents, drawing inserts, draw beads. **Drawing defects, causes and remedies.** **Dies for secondary operations: -** Construction **and working principle of** – Semi piercing dies, shear form dies, dies for formed contours, notching die, shaving die, side piercing die.	14
V	**FINE BLANKING TOOL AND SPECIALISED PRESS TOOL APPLICATION S** **Fine blanking basics:-** Definition and Applications of fine blanking, Working principle of fine blanking tool, V Ring – function of V ring, Dimensions of V ring. Comparison of fine blanking with blanking. Strip width and margin calculations, Calculation of press, Fixing minimum distance from die aperture. Factors affecting Tool life. Importance of punch and die radius. Materials suitable for fine blanking, work hardening during fine blanking, steel, copper and copper alloys, aluminum and aluminum alloys	14

	Fine Blanking Machines:- Working principle – Ram movement, Drive systems-Mechanical drives, hydraulic drives, Machine force, Ring indenter force, counter force. **Fine blanking tools:-** Different types of tools – Compound die tooling system with sliding punch, compound die tooling with fixed punch. Clearance calculation – Importance of clearance **Specialized Press Tool Applications:-** Construction, advantage and applications of advanced multistage tooling, unit tooling, angular piercing tools, CNC turret press. Principle or Quick Die Change (QDC) – need and advantages. Single Minute Exchange of Dies (SMED) – concept need and advantages. **Factors Affecting Tool Service Life:**- Introduction, Elements of Tool performance, Procedure for investigation of tool failure, Trouble shooting in press tools, effect of heat treatment on service life of tools.	
	TEST & REVISION	**05**

Text Books:

1. Donald F. Eary., Edward A. Reed, Techniques of Press working sheet metal, Prentice-Hall,Inc., Second Edition, 1974
2. Donaldson, Tool Design , Tata McGraw-hill Book company, 23rd edition, 2006.
3. . D.Eugene ostergaard, Advanced die making, McGraw-Hill Book company.

References:-

1. . Dr.John G.Nee, Fundamentals of Tool Design, Society of Manufacturing Engineers, Fourth Edition, 1998.
2. . ASTME National Book Committee, McGraw-hill Book company, 1985.
3. J.R.Paquin, Die design fundamentals, Industrial Press Inc, 1990.
4. D.Eugene ostergaard, Basic die making, McGraw-hill Book company,1990.
5. Ivana Suchy, Hand book of Die Design, McGraw-Hill Book company, Second edition, 1997.
6. American Society of Metals – Hand book – Volume 4 (Forming), 8th Edition
7. www.**metalformingmagazine**.com
8. www.**sme.org**

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

32253 – FORGING DIES, DIE CASTING DIES AND DIE MAINTENANCE

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32253
Semester : V
Subject Title : **FORGING DIES, DIE CASTING DIES AND DIE MAINTENANCE**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester**: 15weeks**

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration (Hrs)
			Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
FORGING DIES, DIE CASTING DIES AND DIE MAINTENANCE	5	75	25	75	100	3

Topics and Allocation of Hours:

Unit. No.	TOPIC	TIME (Hrs)
I	Design Of Drop Forging, Press Forging and Machine Forging Dies	14
II	Die Casting Materials , Machines, Die Materials And Treatments	14
III	Die Casting Die Design, Defects And Finishing Of Die Casting Dies	14
IV	Fundamentals Of Die Maintenance	14
V	Trouble Shooting, Die Repair And Maintenance	14
	TEST & REVISION	05
	Total	75

RATIONALE:

Development and use of Forging & Die casting products is high in industries and requires more knowledge on Forging dies and Die Casting Dies and understand of its processes and the operations. This subject will develop the basic knowledge on Forging and Die casting Dies with the process and the basic operations.

OBJECTIVES:

- Explain the fundamentals of forgings, and forging processes.
- Compare the different types of forging
- Design Drop Forging dies.
- Design press forging and Machine forging dies.
- Explain the basics of Die casting process.
- Explain the working of die casting machines.
- Design die casting die
- State the characteristics of the die steel
- Explain the causes and remedies of die casting defects.
- Practice on estimation and costing of dies
- Estimate the cost of dies

32253 - FORGING DIES, DIE CASTING DIES AND DIE MAINTENANCE

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DESIGN OF DROP FORGING, PRESS FORGING AND MACHINE FORGING DIES** **1.1 DROP FORGING DIE DESIGN:-** Hammer dies for preparatory work – fullering dies – edging dies – flattening dies – Drawing down dies – bending die. Essential features of forging dies – generous radii, parting line position, flash gutter, webs and panels, draft, air vents. Flash areas and gutters in finishing dies. Elements of multi impression die block, effect of grain flow. **1.2 PRESS FORGING DIES:-** Rating of forging press, steps in press forging dies, design of press forgings, design of press forging dies. **1.3 MACHINE FORGING DIES**:- General characteristics, techniques used in making these forgings, machine forging description and range, machine forging tools and operation, design of dies for forging machines Laws governing forging machine die design, Examples of forgings produced on forging machines, forging defects – causes and remedies. **1.4 FORGING DIE BLOCKS AND DIES**: Materials and grade of die blocks, applications of various grades of steel used for die blocks and dies-Die insert-Re-sinking of dies- IS code for tool and die steels	14
II	**DIE CASTING MATERIALS , MACHINES, DIE MATERIALS AND TREATMENTS;** **2.1 DIE CASTING MATERIALS:**- Types of die casting alloys – metallurgy, melting & casting procedure and application of zinc based die casting alloys, Aluminum base alloys, Magnesium base alloys, , magnesium base alloys, Copper base alloys , Lead base alloys and Tin base alloys. **2.2 DIE CASTING MACHINES:**- Plunger machine, air machine, modern cold chamber machines. Die locking methods, injection systems, automatic cycle control, and interlock and safety devices in die casting machines. Operation of hot chamber and cold chamber die casting machines. Machine specifications, process parameters and their effect on product quality. Effect of die casting machine on the process – accumulator pressure, injection line pressure, intensification, plunger diameter, locking force, mode of injection, plunger diameter, casting cycle, lubrication.	14

	2.3 DIE MATERIALS AND TREATMENTS:- Characteristics of Tool and Die steels – Choosing of Tool Steels – Heat treatment of die steels – Tool steel production methods – Die surface coatings and treatments – wrought low carbon steels and Cast irons – Non ferrous and non metallic die materials.	
III	**DIE CASTING DIE DESIGN, DEFECTS AND FINISHING OF DIE CASTING DIES;** **3.1 DIE CASTING DIE DESIGN:** Flow system – Importance, metal flow systems in die casting dies, goose neck, nozzle, sprue, runners systems, shock absorbers, gate, gate area, gate velocity, air vent, overflow, determination of gate area. Procedure to calculate runner and gating dimensions using PQ^2 diagram, calculating runner and gating dimensions without PQ^2 diagram. Consideration of specification of die casting machines. Ejection systems – need and working of ejection system, Types of ejection system – sleeve, ring, blade **3.2 DIE CASTING DEFECTS:** Definition, causes and remedies of defects – Shrink holes, Gas holes, Segregation, Shrink cracks, Porosity, Cold shuts, Flow lines & Blooms, Foliations, Hard spots, Surface draws and Depressions, Soldering, sink mark and excessive flash. **3.3 FINISHING OF DIE CASTING DIES:** Trimming and piercing of die casting dies- comparison die casting dies with other products	14
IV	**FUNDAMENTALS OF DIE MAINTENANCE** **4.1 Good Maintenance Practice –** Good grinding practice – Stress relieving cutting tools – shimming die components – ball lock punches and die buttons. **4.2 Cost of Punch and Die Maintenance** - Record casual factors – Real cost of die damage – value of good workman ship. **4.3 Die maintenance documentation and tracking** – Die maintenance team – Systematic die maintenance system – Request for maintenance form – Case study – Continuous improvement.	14
V	**TROUBLE SHOOTING, DIE REPAIR AND MAINTENANCE** **5.1 Effective Die Maintenance Program Strategy –** Understanding The Die Maintenance Facility – Addressing Production- Scheduling Programs – Planning Die Maintenance – Tracking The Cost Of Maintenance And Down Time **5.2 Trouble Shooting Large Panel Stamping Dies** – Die Bolting – Nitrogen Pressure Systems – Systematic Approach To Die Tryout – Draw Beads – Double Action Press Operations – Dirt Problems – Forming Ribs And Embossments – Knockout Bars.	14

	5.3 Repairing Damaged Die Steels And Castings – Making The Repair Decisions- Mechanical Repair Techniques – Electrical Welding Repair. **5.4 Case Study – Phoenix Specialty Manufacturing Company** – Order Entry – Machine Shop Capabilities – Plant Culture – Spare Parts Storage – Ergonomics – Aluminum Die Sets – Bench Die Build Up – Quick Die Change Capabilities – An Eye To The Future.	
	TEST & REVILSION	05

Reference Books:-

1. Meswani., and R.H.Dattani, Design and Manufacture of forging dies
2. Kamenshichikov, S.Koltun and V.Naumov, Forging Practice, MIR publishers.
3. J.C.Sharman, Drop, Press and Machine Forgings, The machinery publishing co ltd.
4. S.K.Hajra Choudhury and A.K.Hajra Choudhury, Elements of Workshop Technology, Media Promoters and publishers pvt. Ltd
5. Charles O.Herb, Die-Casting.
6. H.H.Doehler, Die-casting.
7. H.K and L.C.Barton, Die casting die design
8. Ivana Suchy, Hand book of Die Design, McGraw-Hill Book company, Second edition
9. A.Thomas, Forging Hand book-forging methods, Drop forging Association, Sheffield
10. R.Sharam,S.N.Parsad & N.P.Saxena, Forging Die design and practice, S.Chand & Co
11. V.Vladimi Rov, Die,Mould and jig, MIR Publication
12. S.E.Rusinoff, Forging and Forming metal, S.Chand & Co
13. T.E.Byrer, Forging handbook, American society for metal
14. David A.Smith , Die Maintenance Hand Book, SME Publication.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

32254 – TOOL DESIGN AND DRAWING

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32254
Semester : V
Subject Title : **TOOL DESIGN AND DRAWING**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester**: 15 weeks**

SUBJECT	Instructions		Examination			
			Marks			Duration (Hrs)
	Hours/ Week	Hours/ Semester	Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
TOOL DESIGN AND DRAWING	6	90	25	75	100	3

Topics and Time allocation

TOPIC	TIME (Hrs)
I. Design of Press Tools	45
II. Design of Jigs and Fixtures	25
III. Design of Gauges	15
TEST & REVISION	05
Total	90

32254 - TOOL DESIGN AND DRAWING

DETAILED SYLLABUS

Contents: Theory

Name of the Topic	Hours
I. DESIGN OF PRESS TOOLS: Fourteen steps to design a Press Tool - Design of Blanking / Piercing Tools - Progressive Tool - Compound Tool - Bending Tool (V bending and Edge bending tools) - Draw dies. (Shallow drawing and deep drawing) - Combination Tool.	**45**
II. DESIGN OF JIGS AND FIXTURES: Design of Plate jig (turn over type) - Indexing jig - Milling fixture - Grinding fixture	**25**
III. GAUGE DESIGN 1. Design of Plain plug gauge as per IS 3455, IS 6137, IS 6244, IS 6246 and IS 7018 : Part 2, 2. Design of snap gauge as per is 3477, **3.** Design of plain ring gauges as per IS 3485	**15**
TEST & REVISION	**05**
Total	**90**

References:-

1. J.R.Paquin, Die design fundamentals, Industrial Press Inc, 1990.
2. Donaldson, Tool Design , Tata McGraw-hill Book company, 23rd edition, 2006
3. Donald F. Eary., Edward A. Reed, Techniques of Press working sheet metal, Prentice-Hall,Inc.,Second Edition, 1974.
4. Indian Standard Specifications **IS 3455, IS 6137, IS 6244, IS 6246 ,IS 7018 : Part 2, IS 3477 and IS 3485.**

INSTRUCTIONS FOR QUESTION PAPER SETTING:

1. **Part A** is Tool Design and drawing Question for 50 marks. Either or Type question is to be asked. **One question from UNIT I and one question from Unit II**. The question asked should be such that it could be answered in **135 minutes** time. Please avoid components of very complicated profiles which consumes more time.

2. **Part B** is gauge design and drawing question from **UNIT III** for 25 marks . Please ensure that the tolerance grade for gauge design dimensions are given in question paper which is an essential data for gauge design using standards.

3. For mark and time allocation please refer the model question paper enclosed herewith.

32254 - TOOL DESIGN AND DRAWING

Model Question Paper - I

Note:-

5. **Use of Institution copies of approved data books, Indian Standard Specifications permitted.**
6. **Use Main answer book for writing calculations and other design related writing works .**
7. **The drawings are to be drawn in the given drawing sheet.**
8. **Only one drawing sheet will be issued. Use both the sides of the drawing sheet.**

Part – A :- **50 Marks**

1. (a) Design and draw following views of a progressive tool push through type for the component given in Fig 1.

   i) Sectional elevation ii) Plan **(Question should be from unit I)**

OR

(b) Design and draw the following views of a suitable jig for drilling four 10mm dia holes on the component given in Fig.2.

i) Sectional elevation ii) Plan **(Question should be from unit II)**

Part –B:- (Question should be from unit III) **25 Marks**

2. (a) Design and draw a plain plug gauge as per IS 6244 to inspect a hole of dia 50 H_7.

OR

(b) Design and draw a snap gauge as per IS 3477 to check a shaft of dia 60 p_6

Mark allocation

Part	Detail	Marks allotted	Approximate Time allotted for answering
A	Calculations	10	
	Sectional Elevation	20	
	Plan view	15	
	Bill of materials & Dimensioning	05	
	Total for Part A	**50**	**135 min**
B	Calculations / Selection from IS	10	
	Drawing as per IS	15	
	Total for Part B	**25**	**45 min**
	TOTAL	**75**	**180 min**

Fig 1

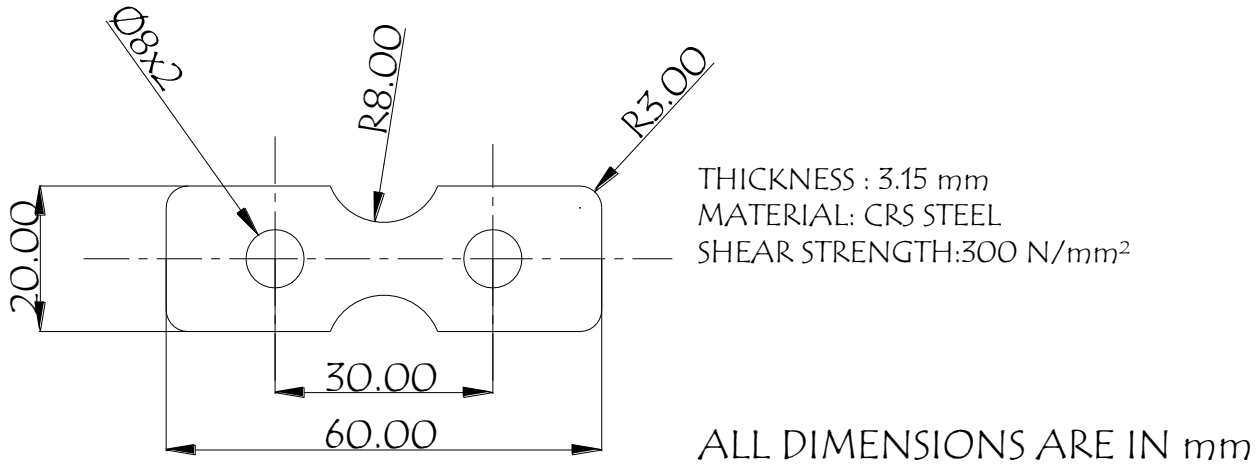
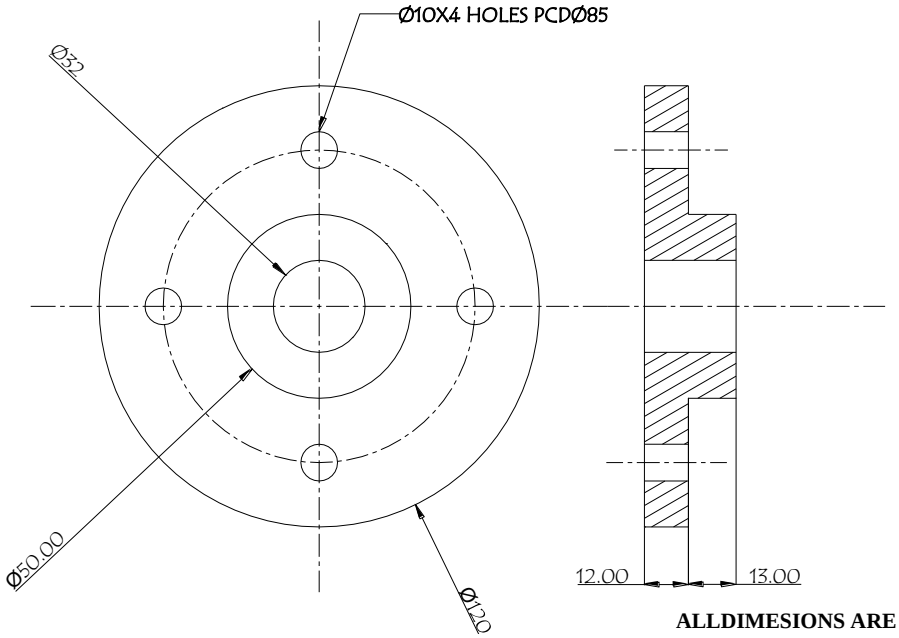


Fig 2

MATERIAL : CAST IRON



ALLDIMESIONS ARE IN mm

32254 - TOOL DESIGN AND DRAWING

Model Question Paper - II

Note:-

1. **Use of Institution copies of approved data books, Indian Standard Specifications permitted.**
2. **Use Main answer book for writing calculations and other design related writing works .**
3. **The drawings are to be drawn in the given drawing sheet.**
4. **Only one drawing sheet will be issued. Use both the sides of the drawing sheet.**

Part – A :- **50 Marks**

1. (a) Design a compound tool for the given component made out of stainless steel and 1mm thickness .shown in fig1.

   i) Sectional elevation ii) Plan **(Question should be from unit I)**

OR

(b) Design a milling fixture for the component made out of steel as shown in fig 2.

i) Sectional elevation ii) Plan **(Question should be from unit II)**

Part –B:- (Question should be from unit III) **25 Marks**

2. (a) Design and draw a plug gauge as per IS 7018 to inspect a hole of Ø 30 H_7.

OR

(b) Design and draw snap gauge as per IS 3477 to inspect a shaft of Ø30H_6.

Mark allocation

Part	Detail	Marks allotted	Approximate Time allotted for answering
A	Calculations	10	
	Sectional Elevation	20	
	Plan view	15	
	Bill of materials & Dimensioning	05	
	Total for Part A	**50**	**135 min**
B	Calculations / Selection from IS	10	
	Drawing as per IS	15	
	Total for Part B	**25**	**45 min**
	TOTAL	**75**	**180 min**

. FIG-1

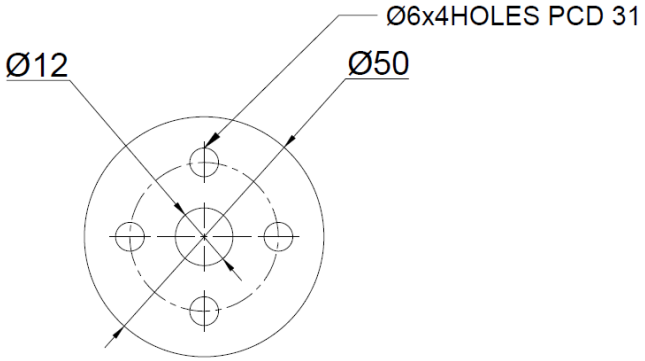
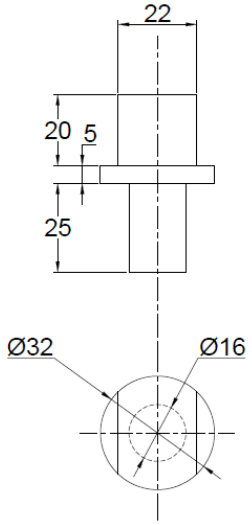


FIG-2



DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

32255 – PRESS TOOLS-I PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32255
Semester : V
Subject Title : **PRESS TOOLS-I PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester**: 15 weeks**

SUBJECT	Instructions		Examination			
			Marks			Duration (Hrs)
	Hours/ Week	Hours/ Semester	Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
PRESS TOOLS- I PRACTICAL	5	75	25	75	100	16

OBJECTIVES:

At the end of the practice, the students will be able to

- Manufacture press tool components as per the given drawing.
- Assemble the components manufactured.
- Set the tools manufactured in the OBI / gap frame / Fly press as per requirement.
- Adjust the shut height; operate the press to take trial production.
- Compare the result with the requirement and to do the necessary corrections if needed.

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DETAILED SYLLABUS

Ex. No.	Name of the exercise	Time in Hours
1.	Manufacture of Blanking Tool – Drop through type	**15**
2.	Manufacture of piercing tool	**15**
3.	Manufacture of Progressive Tool – Drop through type	**20**
4.	Manufacture or Compound Tool	**25**
	TOTAL	**75**

Note:-

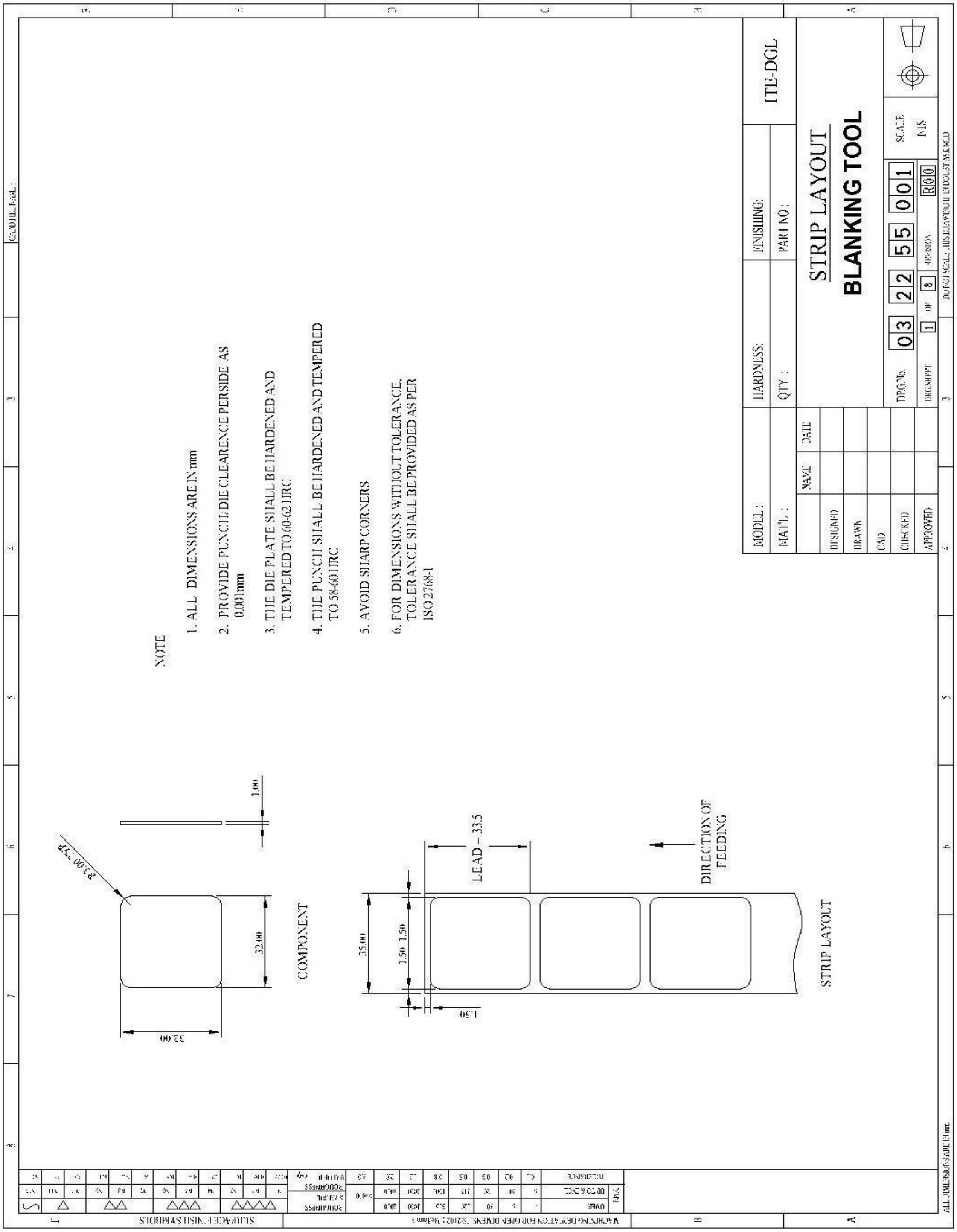
1. Batch size should not be more than 5 students for Practical classes.
2. **For examination, exercise should be given to students individually** and not in batches.
3. The examination duration is **16 hours.**
4. Students should be trained in Press Setting, Tool setting, shut height adjustment, trial production using the tool fabricated by them and rectification of tool defects if any.
5. For Board examination any one of the above tool (slno 1 to 4) is to be fabricated by each student, fitted in the press and trial production should be taken. The evaluation of the performance should be based on the component dimensions and finish obtained from the tool fabricated by the student during the 16 hours examination.
6. For all the four exercises, the sketches are given and should be followed.

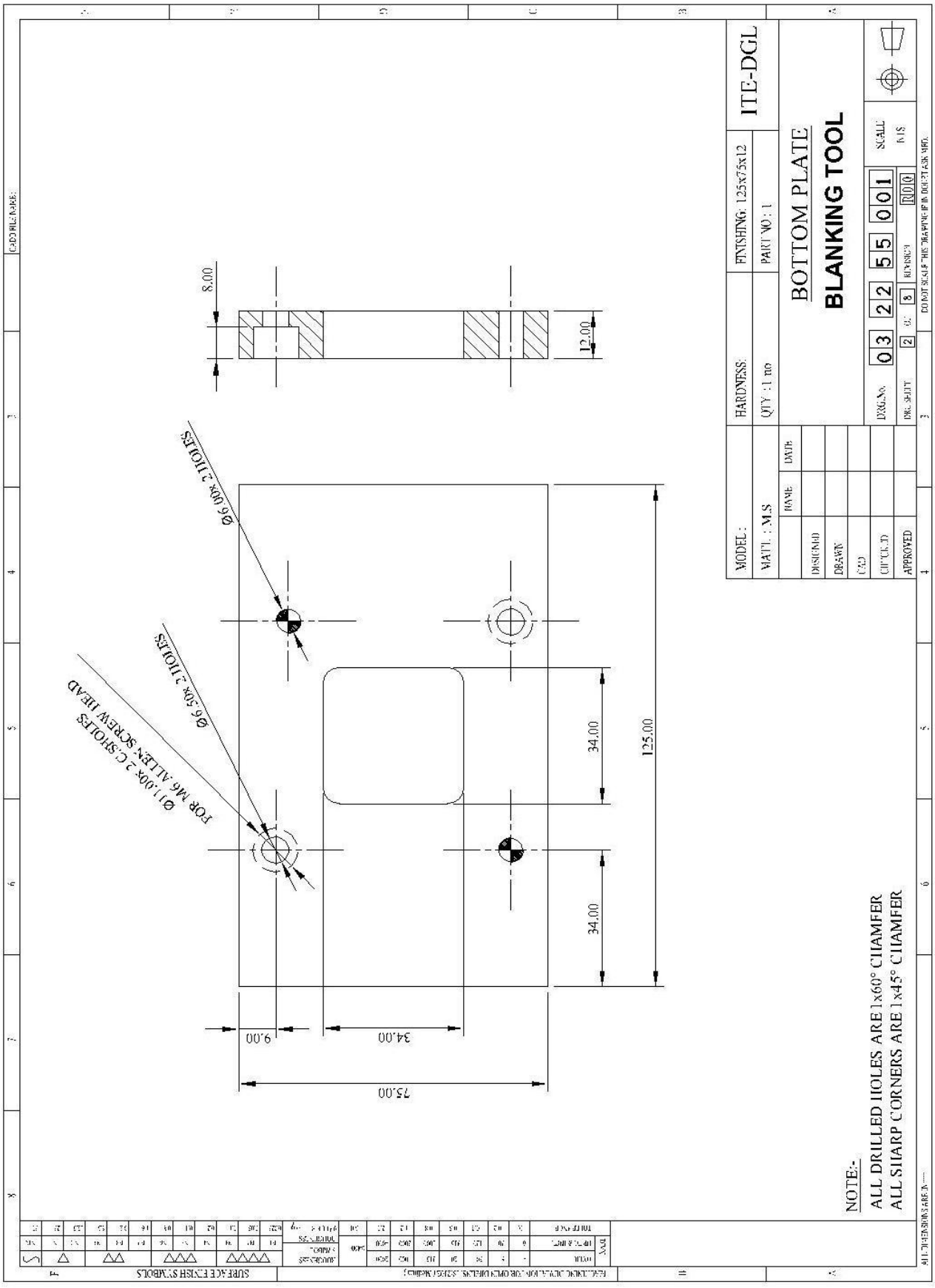
SCHEME OF EXAMINATION:

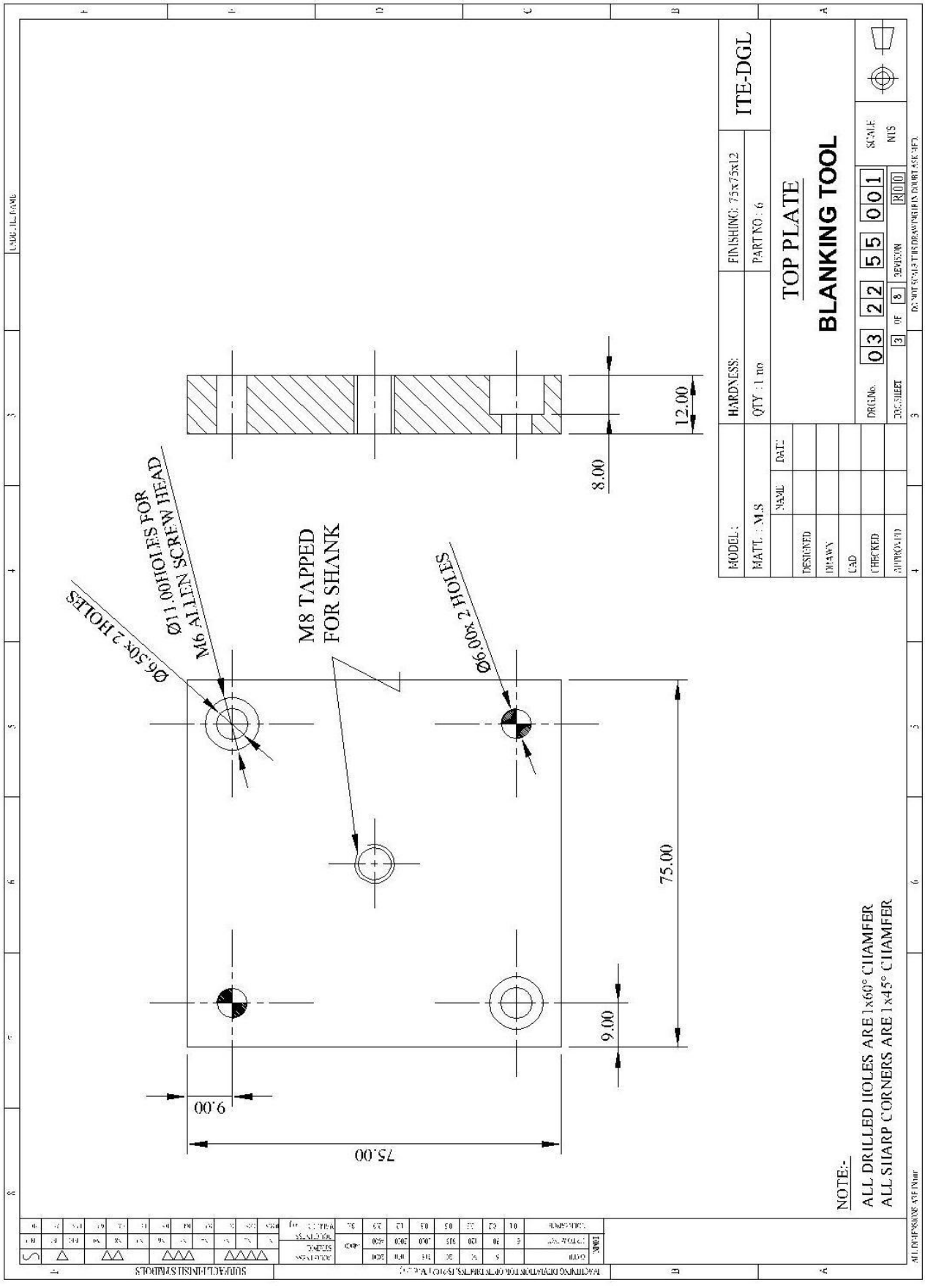
Manufacture of Tool	-	30 marks
Tool finish	-	20 marks
Component finish / accuracy	-	10 marks
Tool setting & trial production	-	10 Marks
Viva Voce	-	05 Marks
Total	**-**	**75 Marks**

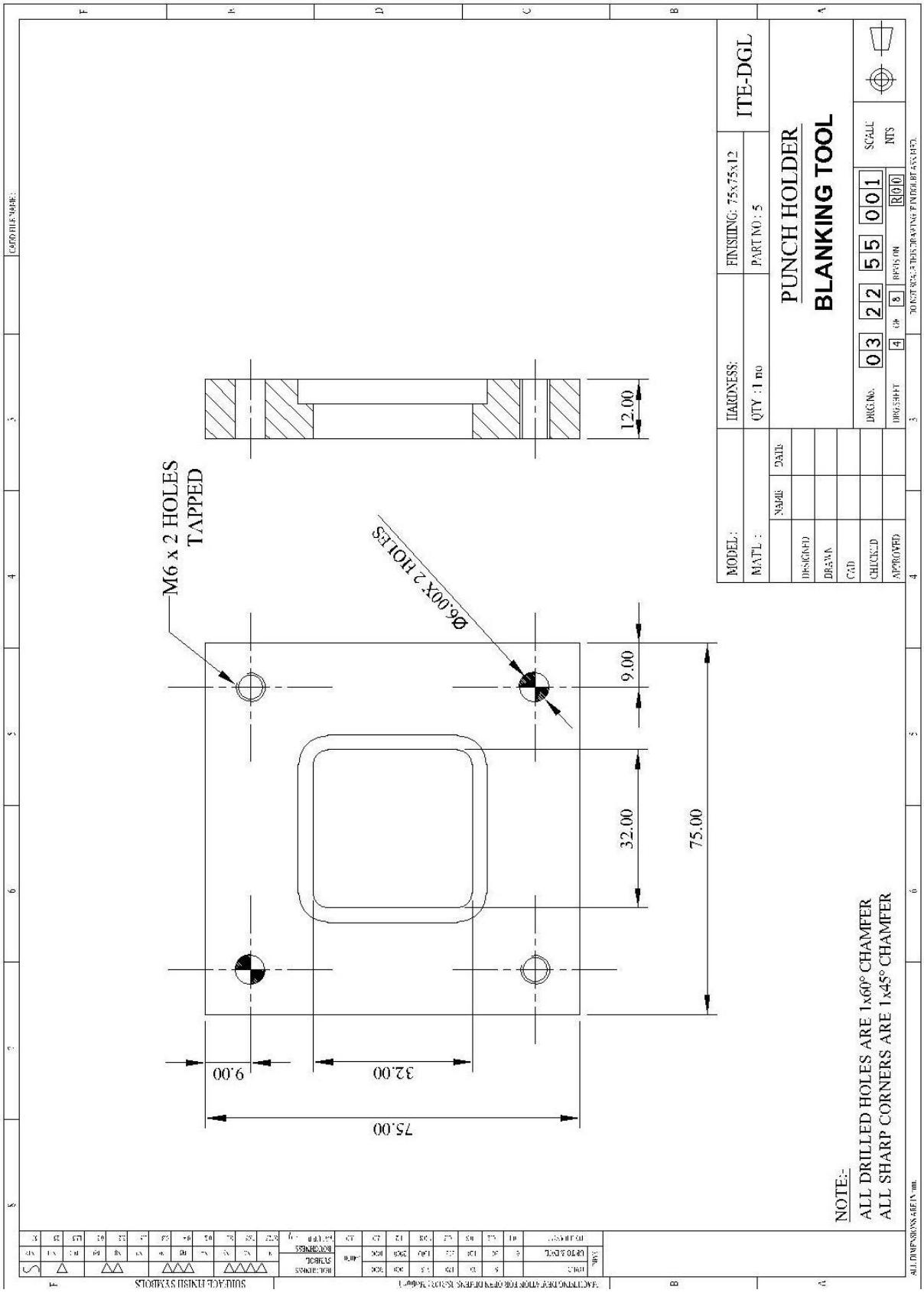
.

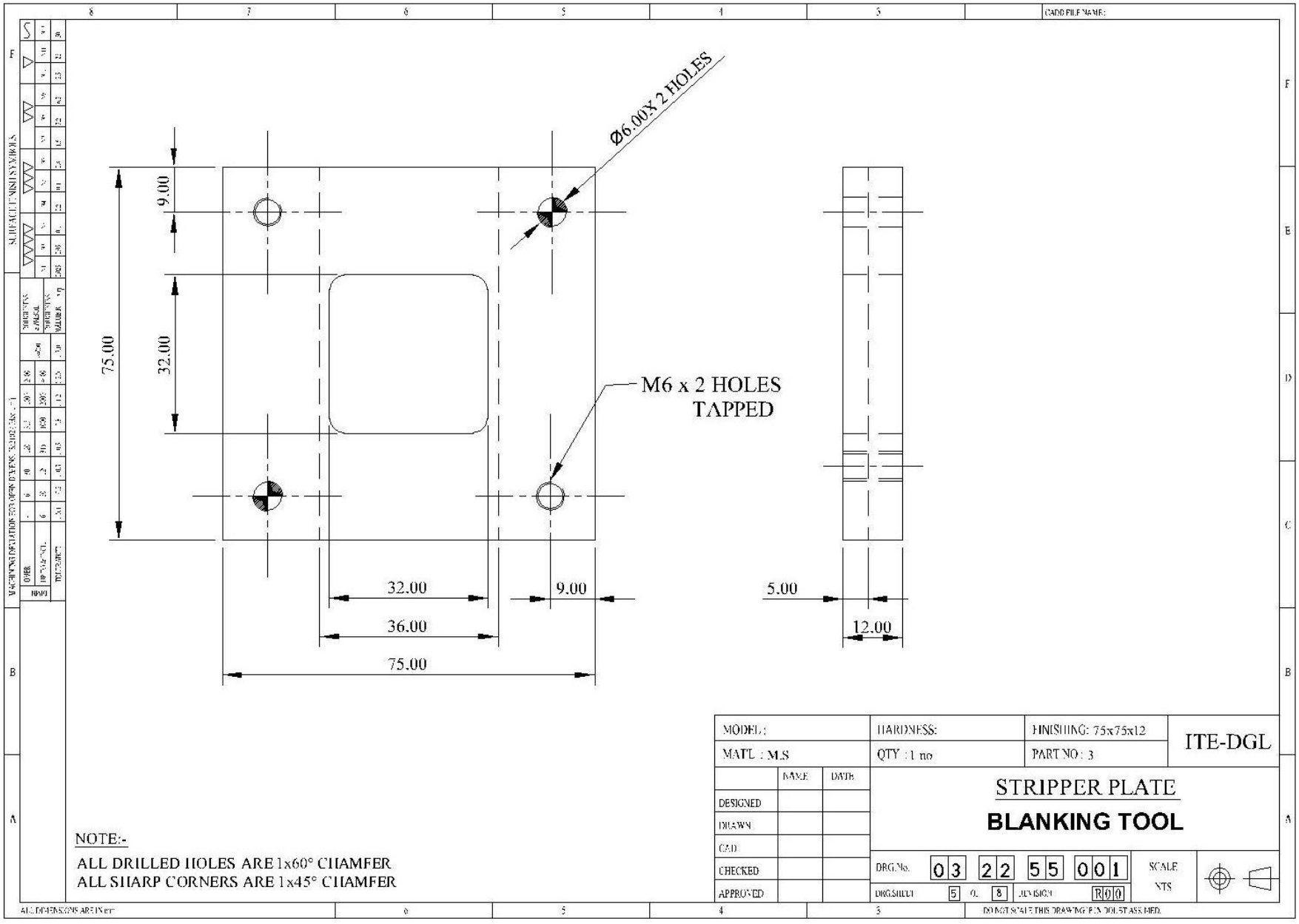
Exercise-I Blanking Tool – Drop through type

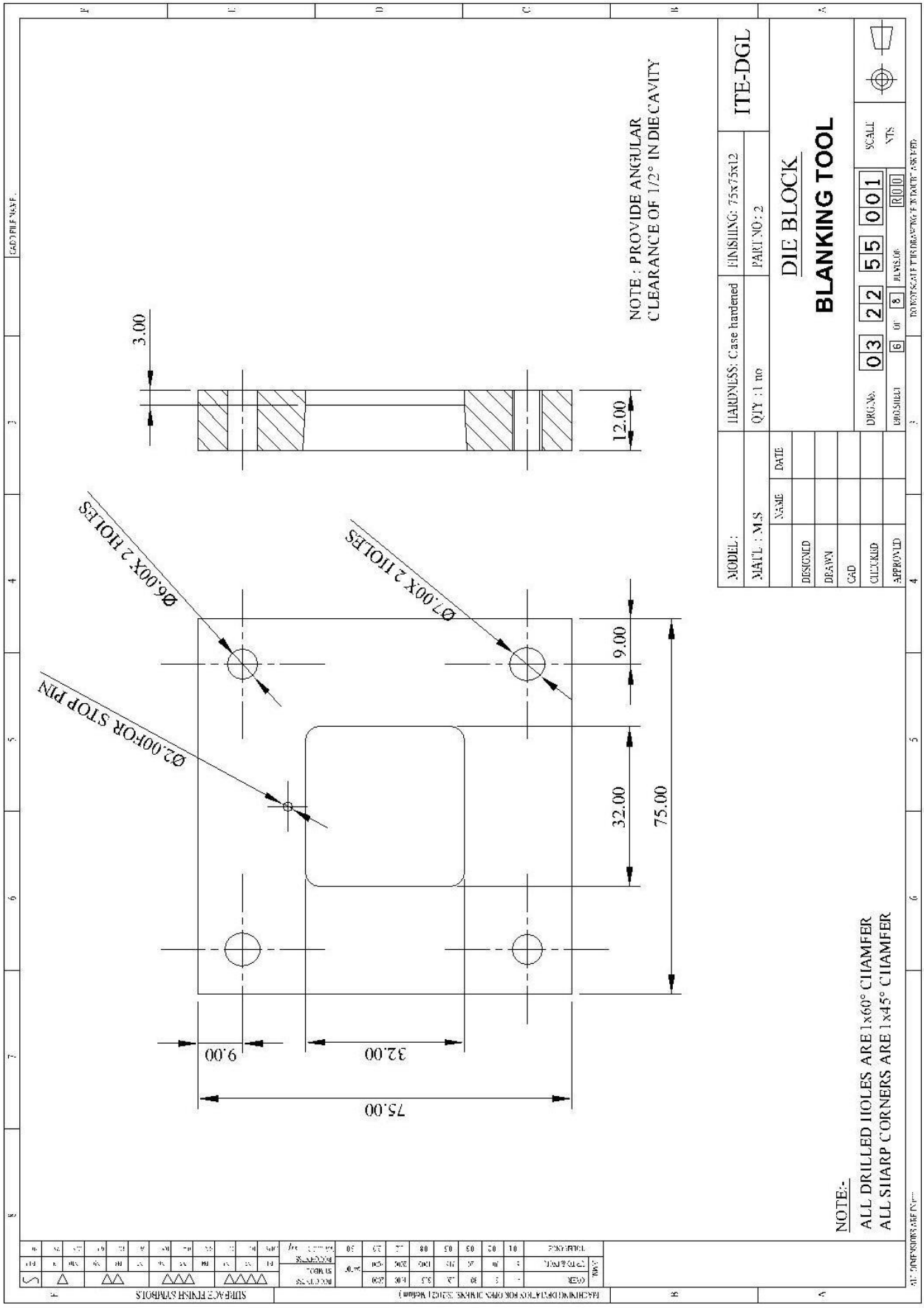

NOTE
1. ALL DIMENSIONS ARE IN mm
2. PROVIDE PUNCH/DIE CLEARENCE PERSIDE AS 0.001mm
3. THE DIE PLATE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC
4. THE PUNCH SHALL BE HARDENED AND TEMPERED TO 58-60 HRC
5. AVOID SHARP CORNERS
6. FOR DIMENSIONS WITHOUT TOLERANCE, TOLERANCE SHALL BE PROVIDED AS PER ISO 2768-1
32.00
32.00
1.00
COMPONENT
35.00
1.50
1.50
1.50
LEAD - 33.5
DIRECTION OF FEEDING
STRIP LAYOUT
MODEL :
MAT'L :
HARDNESS:
QTY :
FINISHING:
PART NO :
ITI-DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
STRIP LAYOUT
BLANKING TOOL
DRG.No.
03 22 55 001
SCALE
NTS
R00
SURFACE FINISH SYMBOLS

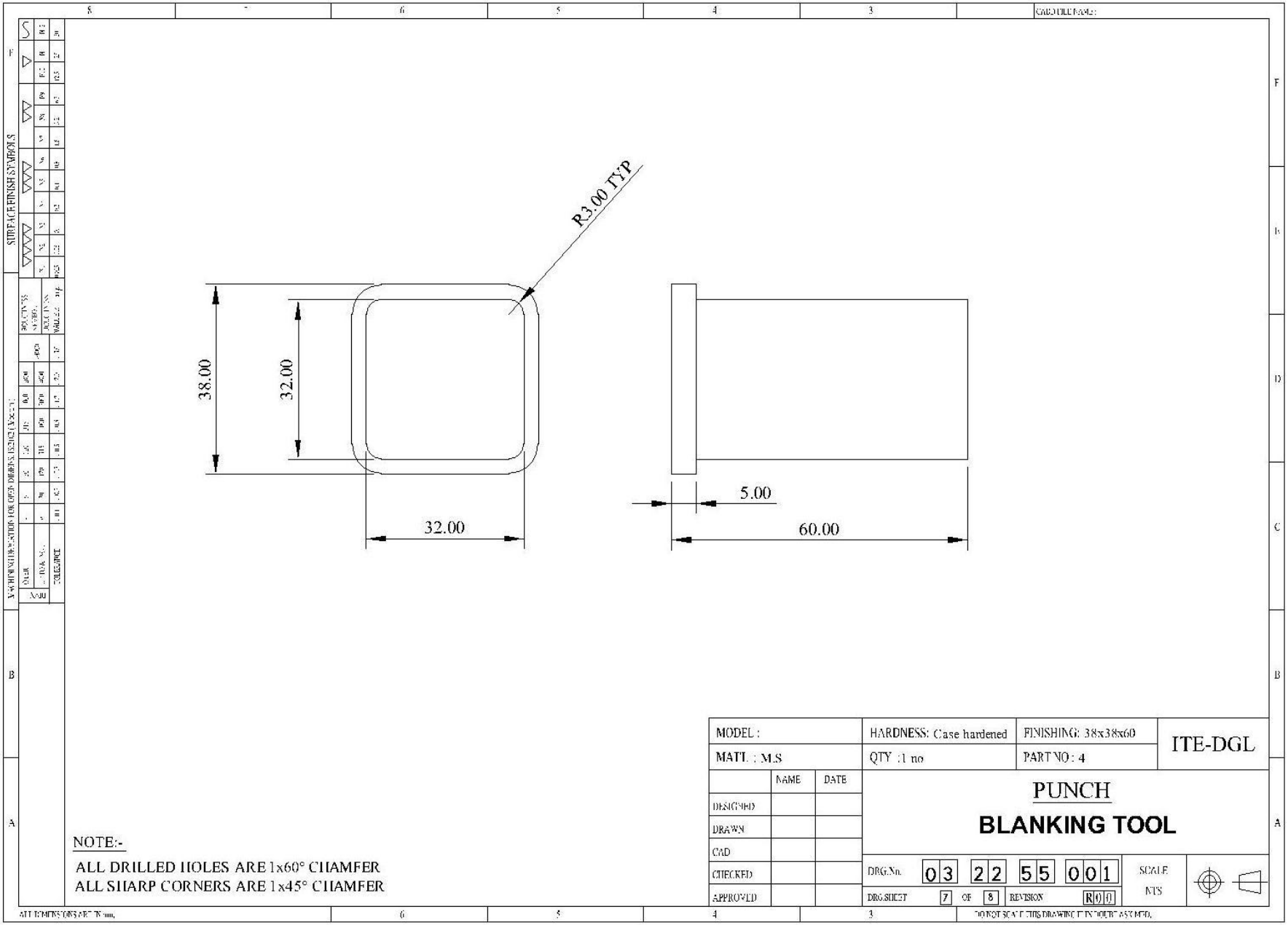

8.00
12.00
Ø 9.00x 2 HOLES
Ø6.50x 2 HOLES
Ø11.00x 2 C.SHOLES
FOR M6 ALLEN SCREW HEAD
34.00
125.00
34.00
9.00
34.00
75.00
MODEL :
MATL : M.S
HARDNESS
QTY : 1 no
FINISHING: 125x75x12
PART WO : 1
ITE-DGL
BOTTOM PLATE
BLANKING TOOL
DWG.NO. 03 22 55 001
SCALE 1:1
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

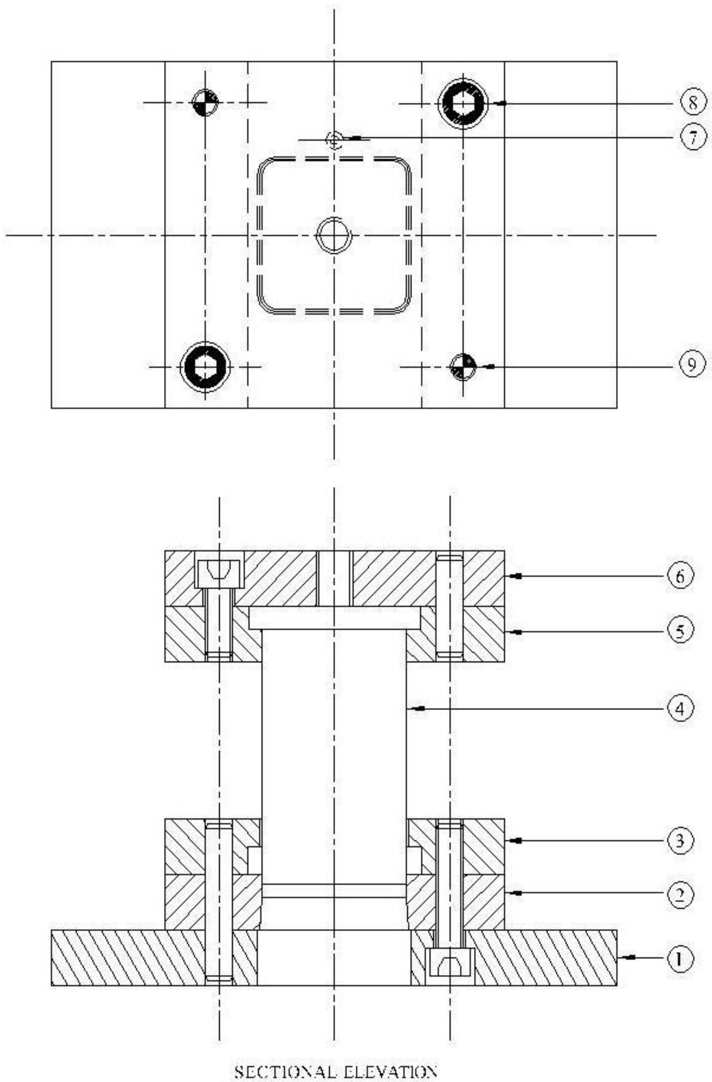

TOP PLATE
BLANKING TOOL
ITE-DGL
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 75x75x12
PART NO : 6
DRG.No. 03 22 55 001
SCALE NTS
SHEET 3 OF 8
REVISION R100
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DO NOT SCALE THIS DRAWING
Ø6.50x 2 HOLES
Ø11.00HOLES FOR M6 ALLEN SCREW HEAD
M8 TAPPED FOR SHANK
Ø6.00x 2 HOLES
12.00
8.00
75.00
9.00
75.00
9.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


M6 x 2 HOLES TAPPED
Ø6.00X 2 HOLES
12.00
9.00
32.00
75.00
9.00
32.00
75.00
MODEL :
MATL :
HARDNESS:
QTY : 1 no
FINISHING: 75x75x12
PART NO : 5
ITE-DGL
PUNCH HOLDER
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE NTS
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


Ø6.00X 2 HOLES
M6 x 2 HOLES
TAPPED
9.00
32.00
75.00
32.00
9.00
36.00
75.00
5.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x12
ITE-DGL
MATL : M.S
QTY : 1 no
PART NO : 3
STRIPPER PLATE
BLANKING TOOL
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DRG.No. 03 22 55 001
SCALE NTS
DRG.SHEET 5 OF 8
REVISION R00
DO NOT SCALE THIS DRAWING IF IN DOUBT ASSK HED.


NOTE : PROVIDE ANGULAR
CLEARANCE OF 1/2° IN DIE CAVITY
3.00
12.00
Ø6.00X 2 HOLES
Ø7.00X 2 HOLES
Ø2.00FOR STOP PIN
9.00
32.00
75.00
9.00
32.00
75.00
MODEL :
MATL : M.S
HARDNESS: Case hardened
QTY : 1 no
FINISHING: 75x75x12
PART NO: 2
ITE-DGL
DIE BLOCK
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


R3.00 TYP
38.00
32.00
32.00
5.00
60.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS: Case hardened
FINISHING: 38x38x60
ITE-DGL
MATL : M.S
QTY :1 no
PART NO : 4
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
PUNCH
BLANKING TOOL
DRG.No. 03 22 55 001
SCALE NTS
DRG.SHEET 7 OF 8
REVISION R0 0



BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
9	Ø6 DOWEL	STD	4
8	M6 ALLEN SCREW	STD	4
7	STOP PIN	STD	1
6	TOP PLATE	M.S	1
5	PUNCH HOLDER	M.S	1
4	BLANKING PUNCH	M.S (CASE HARDENED)	1
3	STRIPPER PLATE	M.S	1
2	DIE BLOCK	M.S (CASE HARDENED)	1
1	BOTTOM PLATE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MAT'L :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

BLANKING TOOL

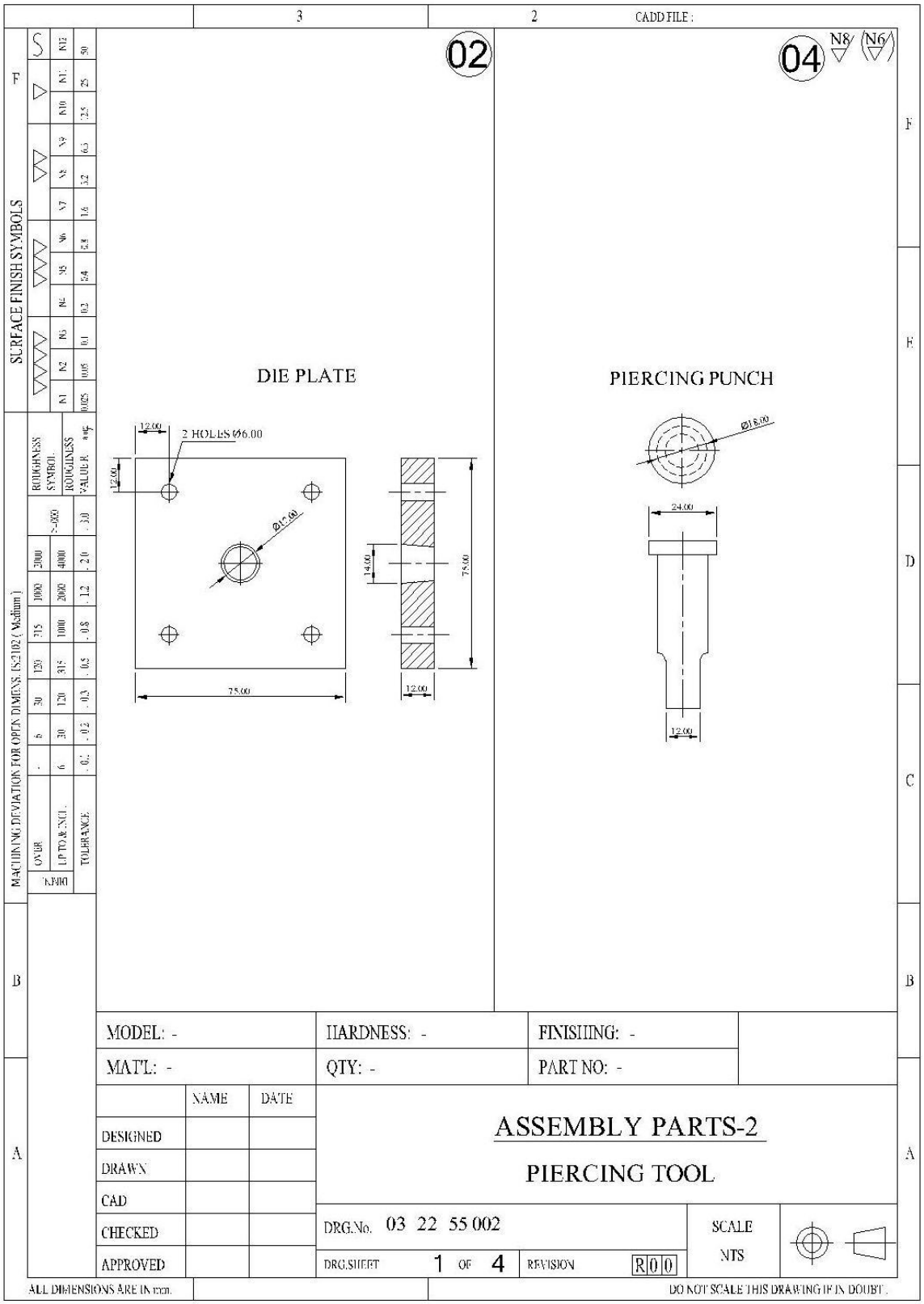
DRG.No. 03 22 55 001 — SCALE NTS

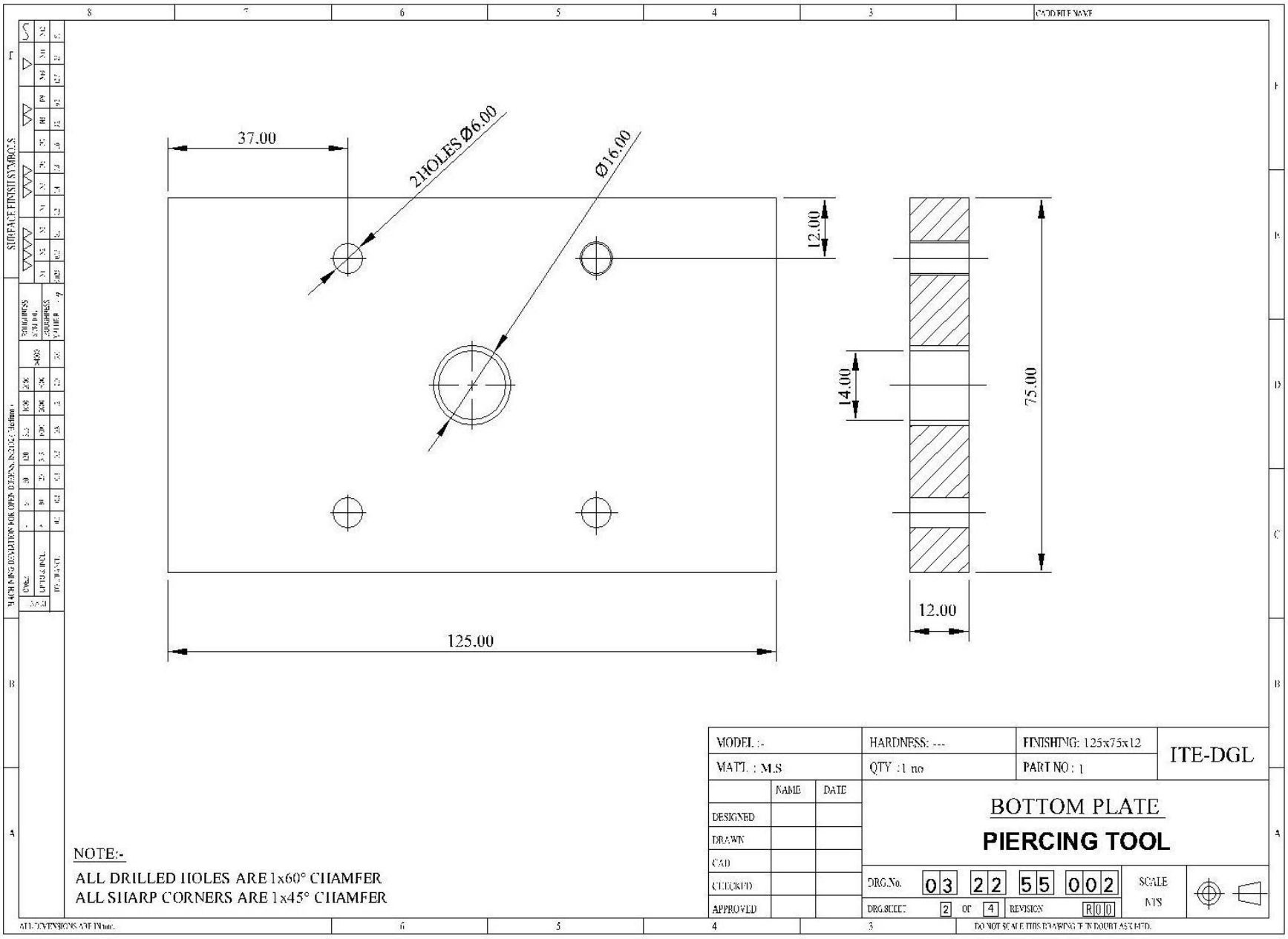
DRG.SHEET 8 OF 8 — REVISION R00

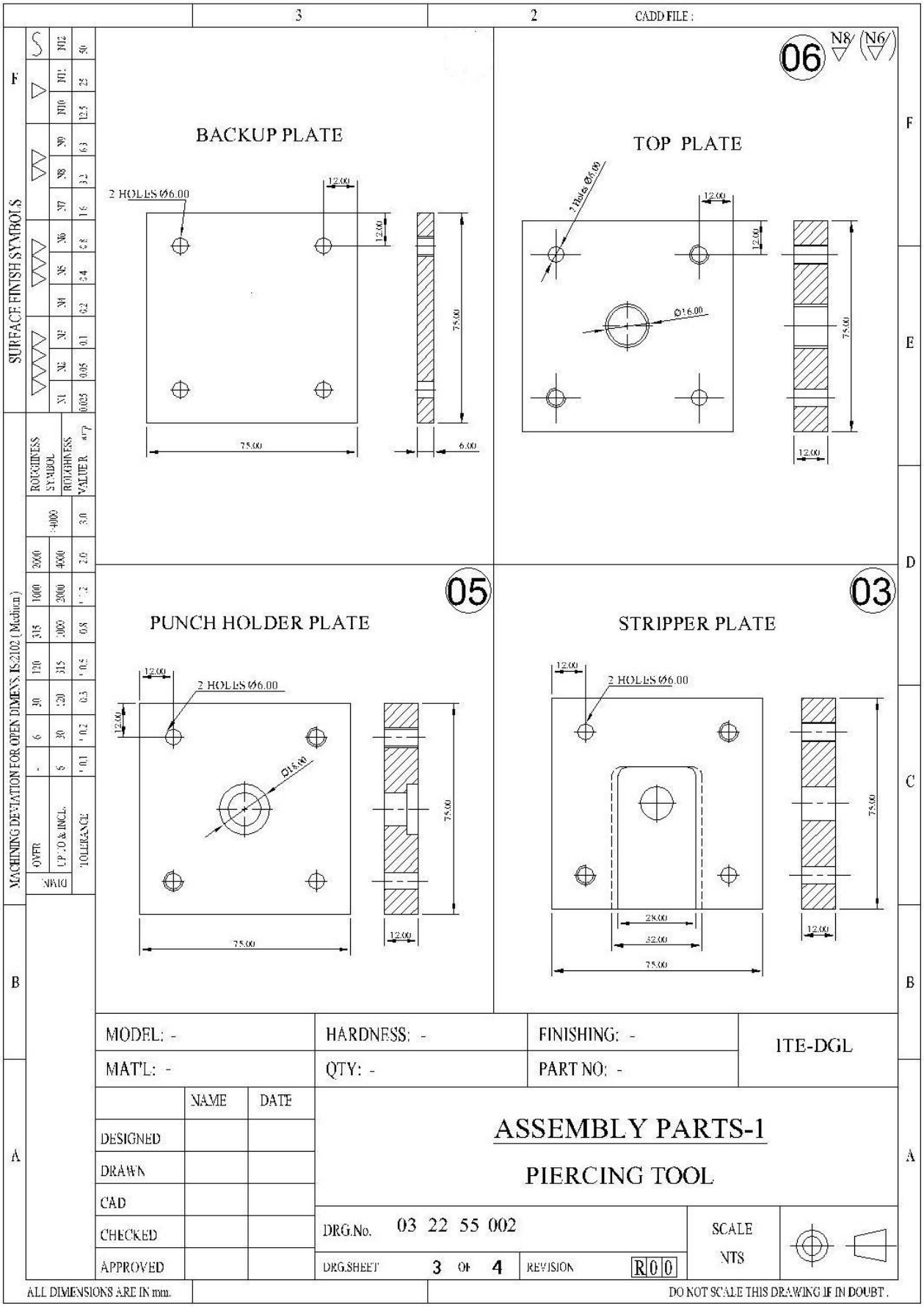
ALL DIMENSIONS ARE IN mm.

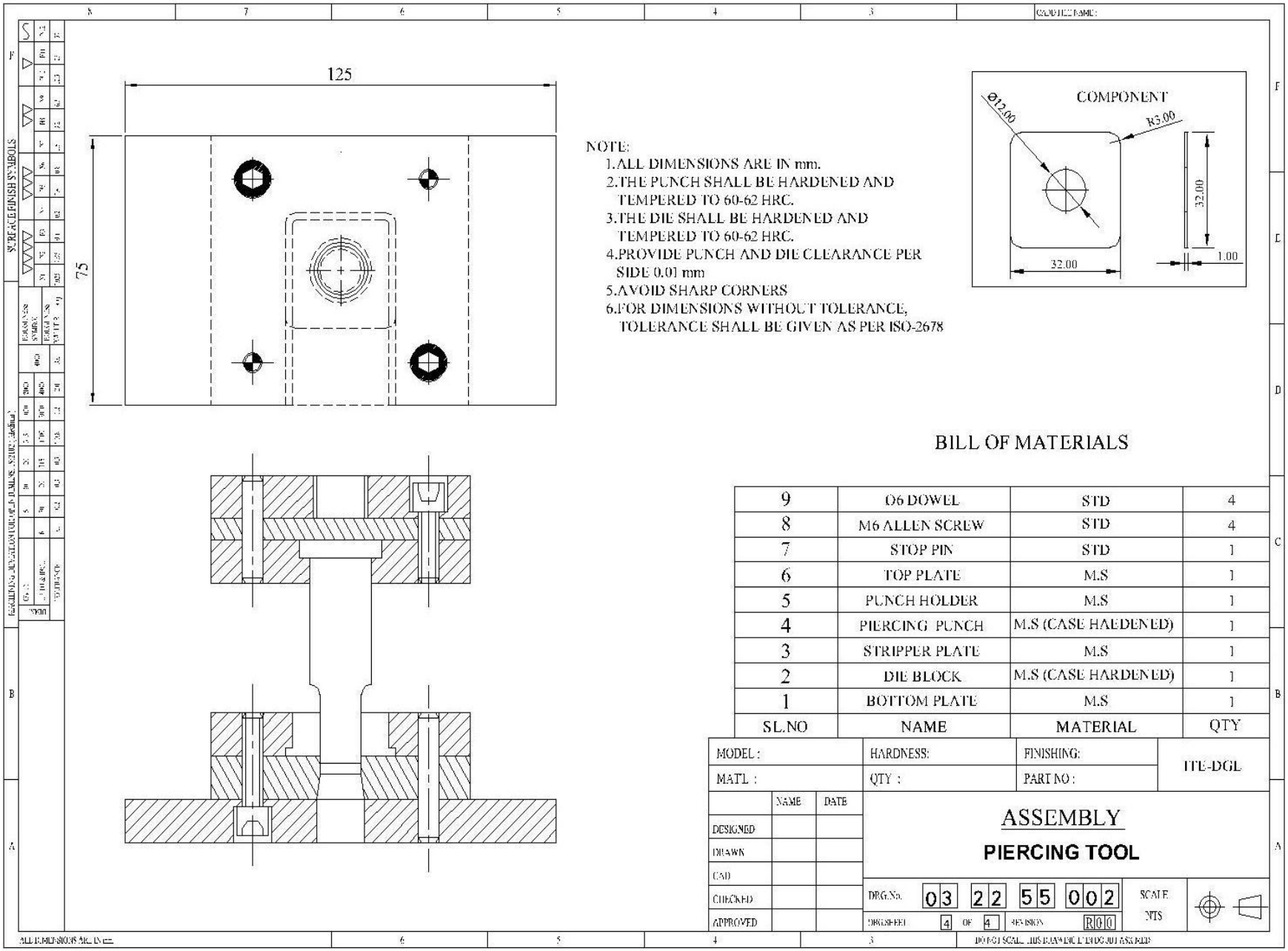
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK MFD.

Exercise-II Piercing Tool




37.00
2HOLES Ø6.00
Ø16.00
12.00
14.00
75.00
12.00
125.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 125x75x12
ITE-DGL
MATL : M.S
QTY :1 no
PART NO : 1
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BOTTOM PLATE
PIERCING TOOL
DRG.No. 03 22 55 002
SCALE NTS
DRG.SHEET 2 OF 4
REVISION R00
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME.


CADD FILE :
06
BACKUP PLATE
2 HOLES Ø6.00
12.00
75.00
6.00
TOP PLATE
Ø16.00
05
PUNCH HOLDER PLATE
Ø18.00
03
STRIPPER PLATE
28.00
32.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
ITE-DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
PIERCING TOOL
DRG.No. 03 22 55 002
SCALE NTS
DRG.SHEET 3 OF 4
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.



NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. THE PUNCH SHALL BE HARDENED AND TEMPERED TO 60-62 HRC.
3. THE DIE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC.
4. PROVIDE PUNCH AND DIE CLEARANCE PER SIDE 0.01 mm
5. AVOID SHARP CORNERS
6. FOR DIMENSIONS WITHOUT TOLERANCE, TOLERANCE SHALL BE GIVEN AS PER ISO-2678

BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
9	O6 DOWEL	STD	4
8	M6 ALLEN SCREW	STD	4
7	STOP PIN	STD	1
6	TOP PLATE	M.S	1
5	PUNCH HOLDER	M.S	1
4	PIERCING PUNCH	M.S (CASE HAEDENED)	1
3	STRIPPER PLATE	M.S	1
2	DIE BLOCK	M.S (CASE HARDENED)	1
1	BOTTOM PLATE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

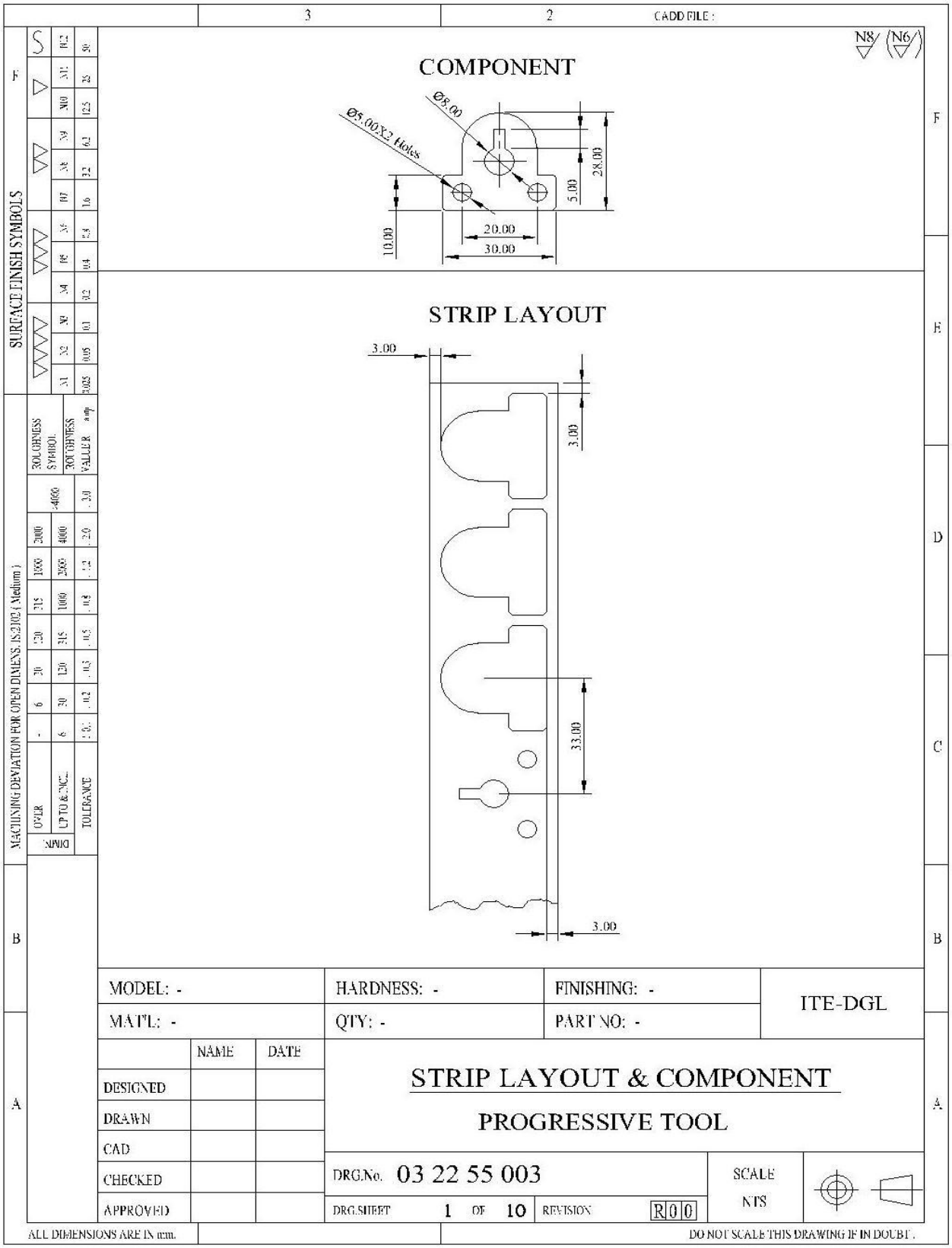
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

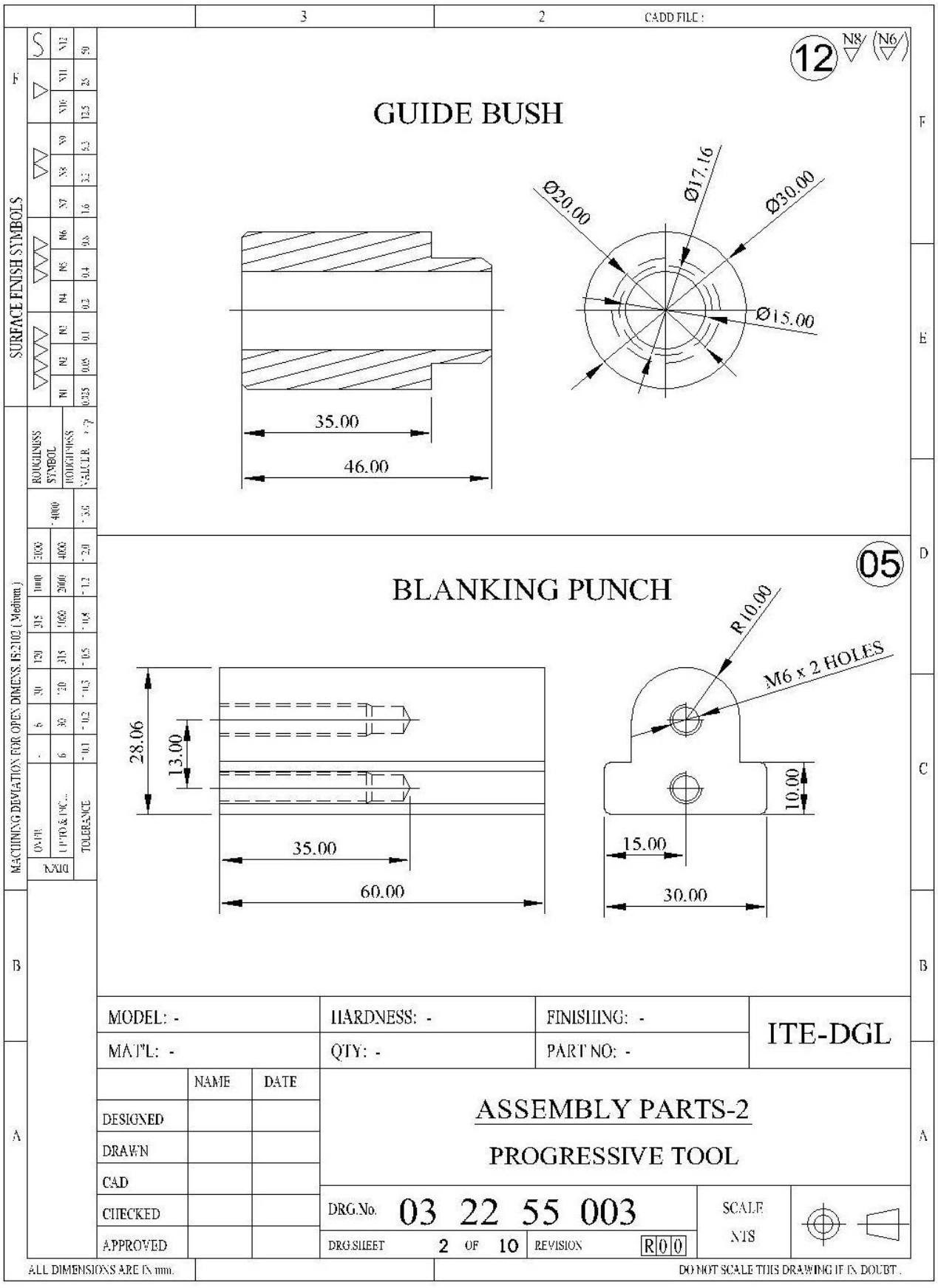
ASSEMBLY

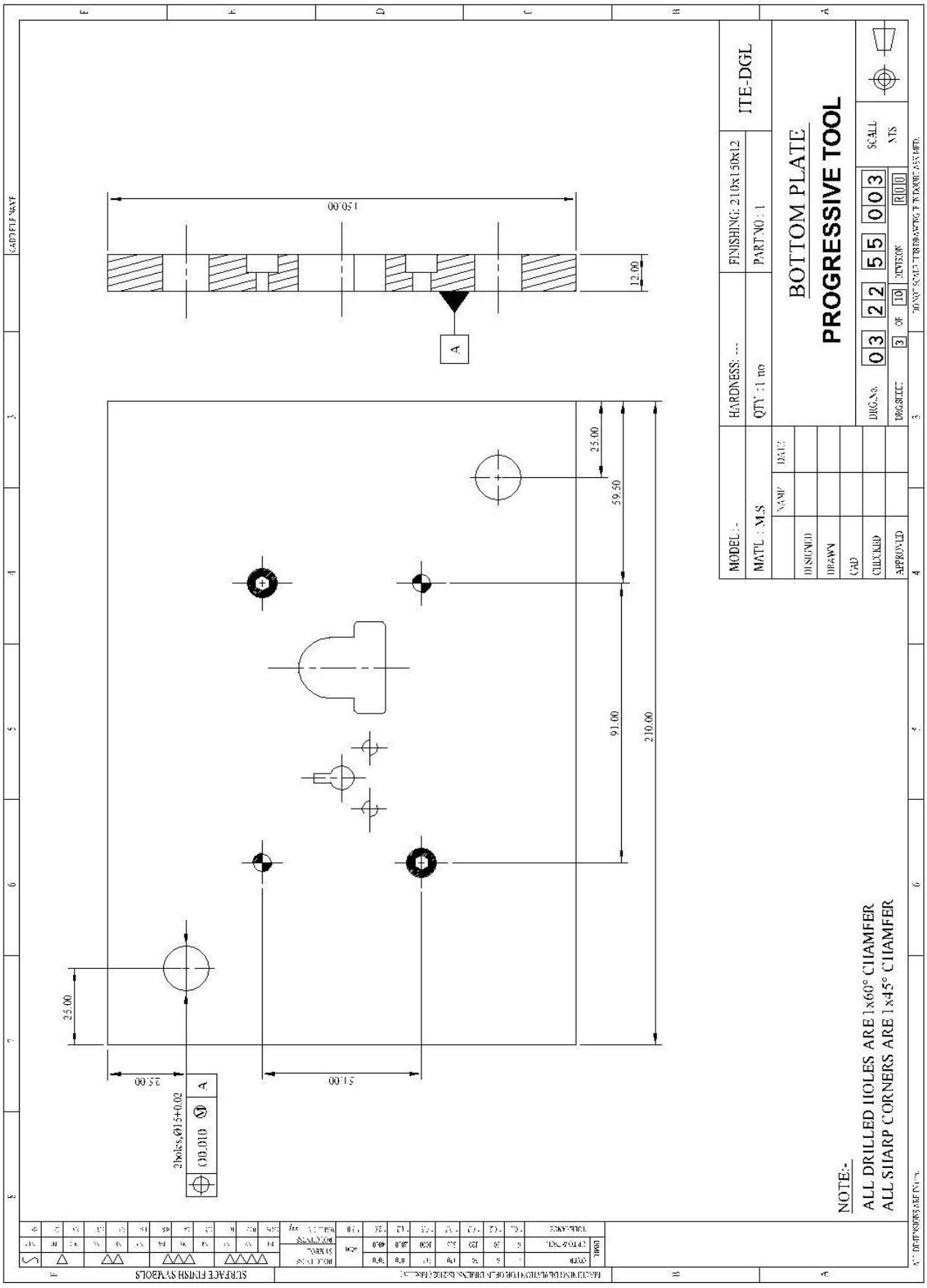
PIERCING TOOL

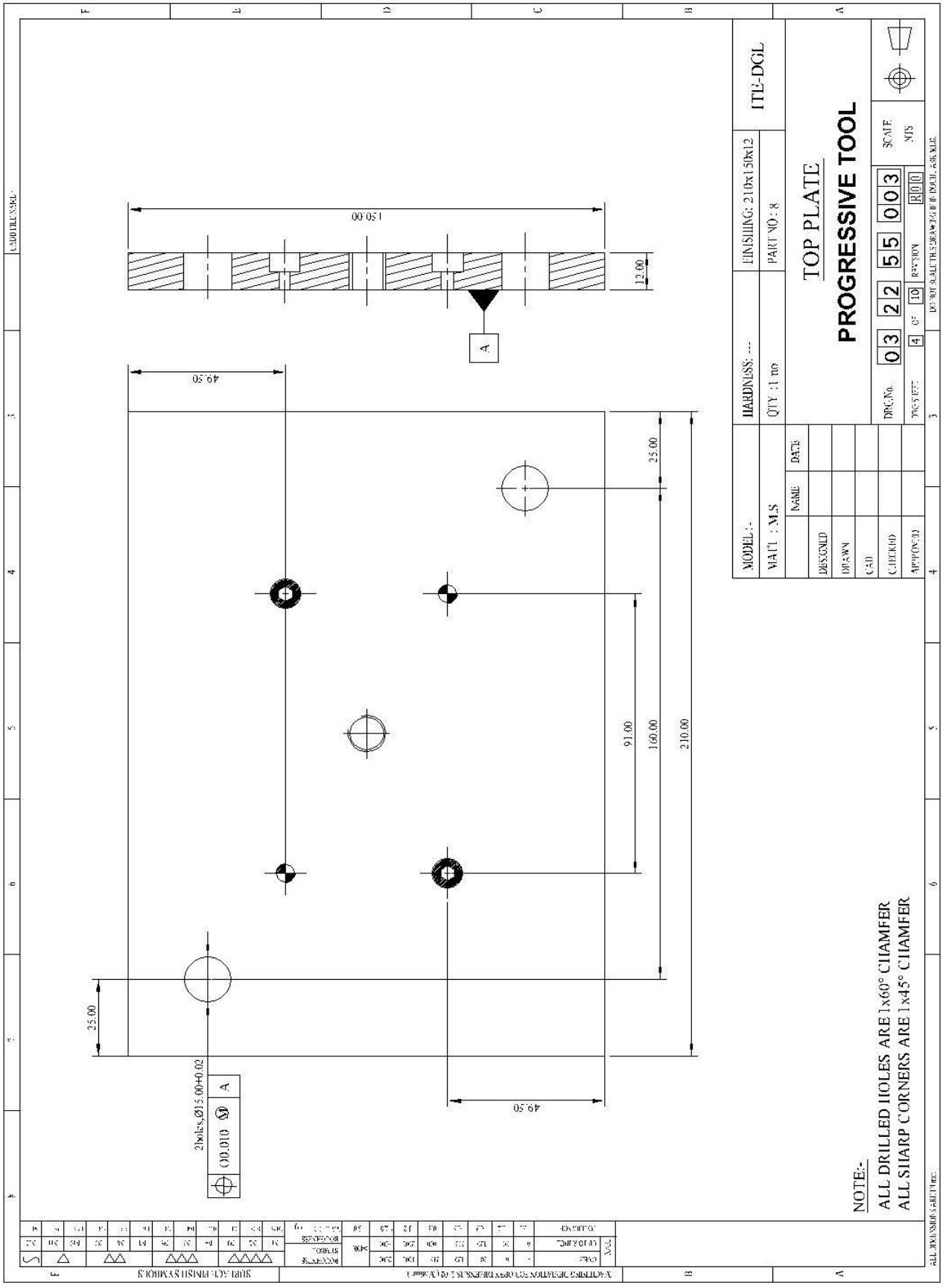
DRG.No. 03 22 55 002 | SCALE NTS | DRG.SHEET 4 OF 4 | REVISION R00

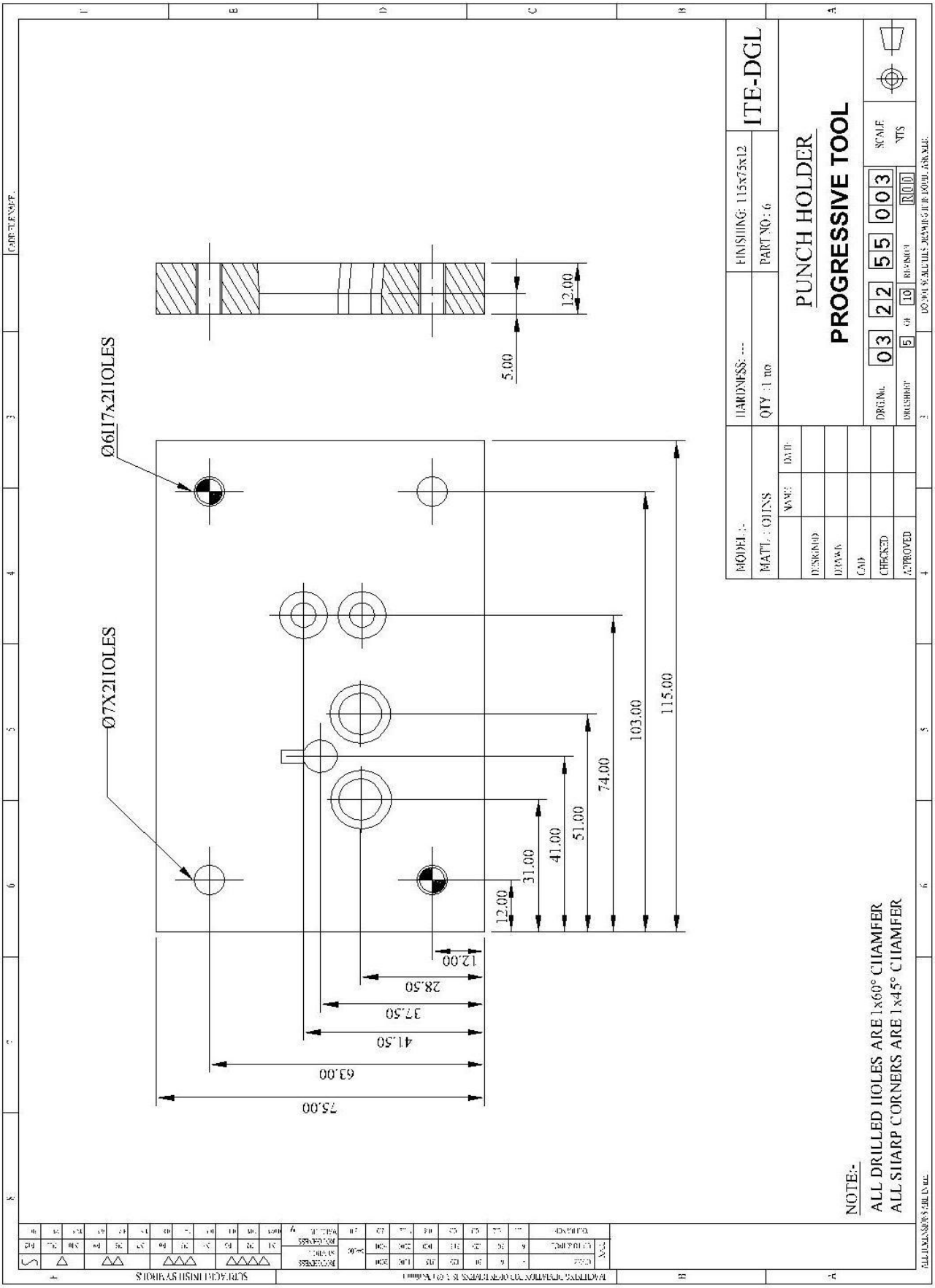
Exercise – III Progressive Tool

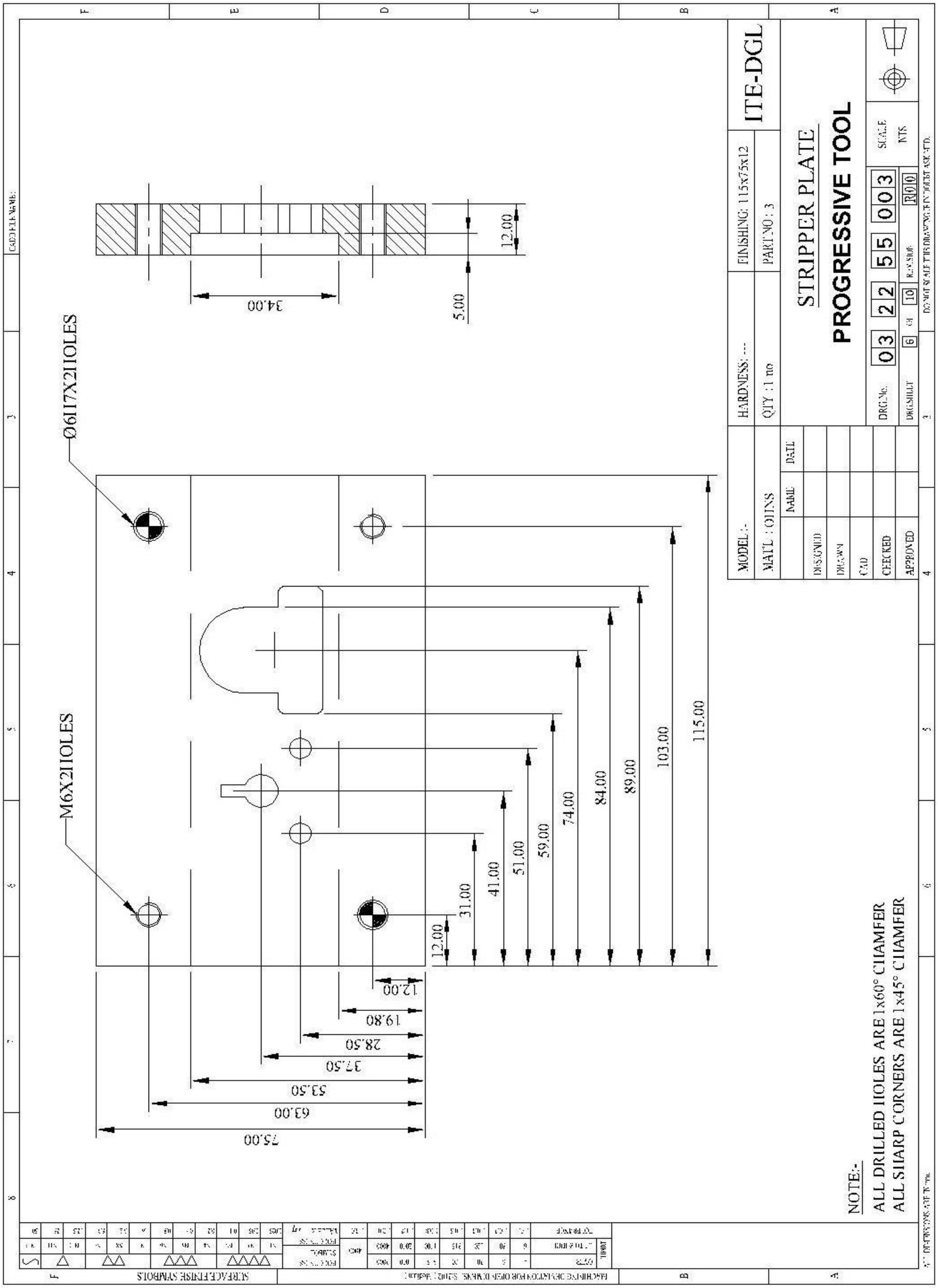


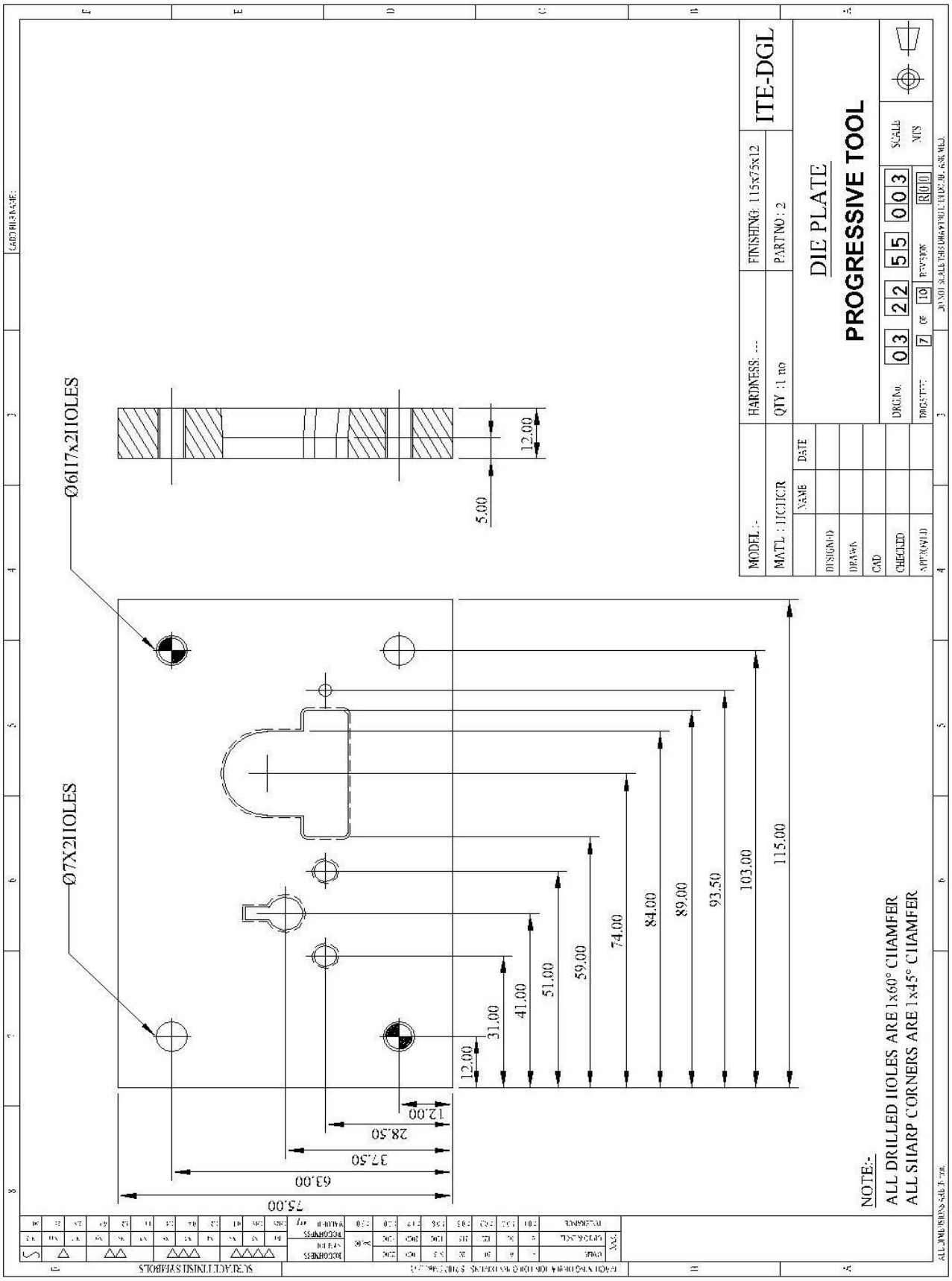

CADD FILE :
12
N8
(N6)
GUIDE BUSH
Ø20.00
Ø17.16
Ø30.00
Ø15.00
35.00
46.00
05
BLANKING PUNCH
R10.00
M6 x 2 HOLES
28.06
13.00
10.00
35.00
60.00
15.00
30.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
ITE-DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-2
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
DRG.SHEET 2 OF 10
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

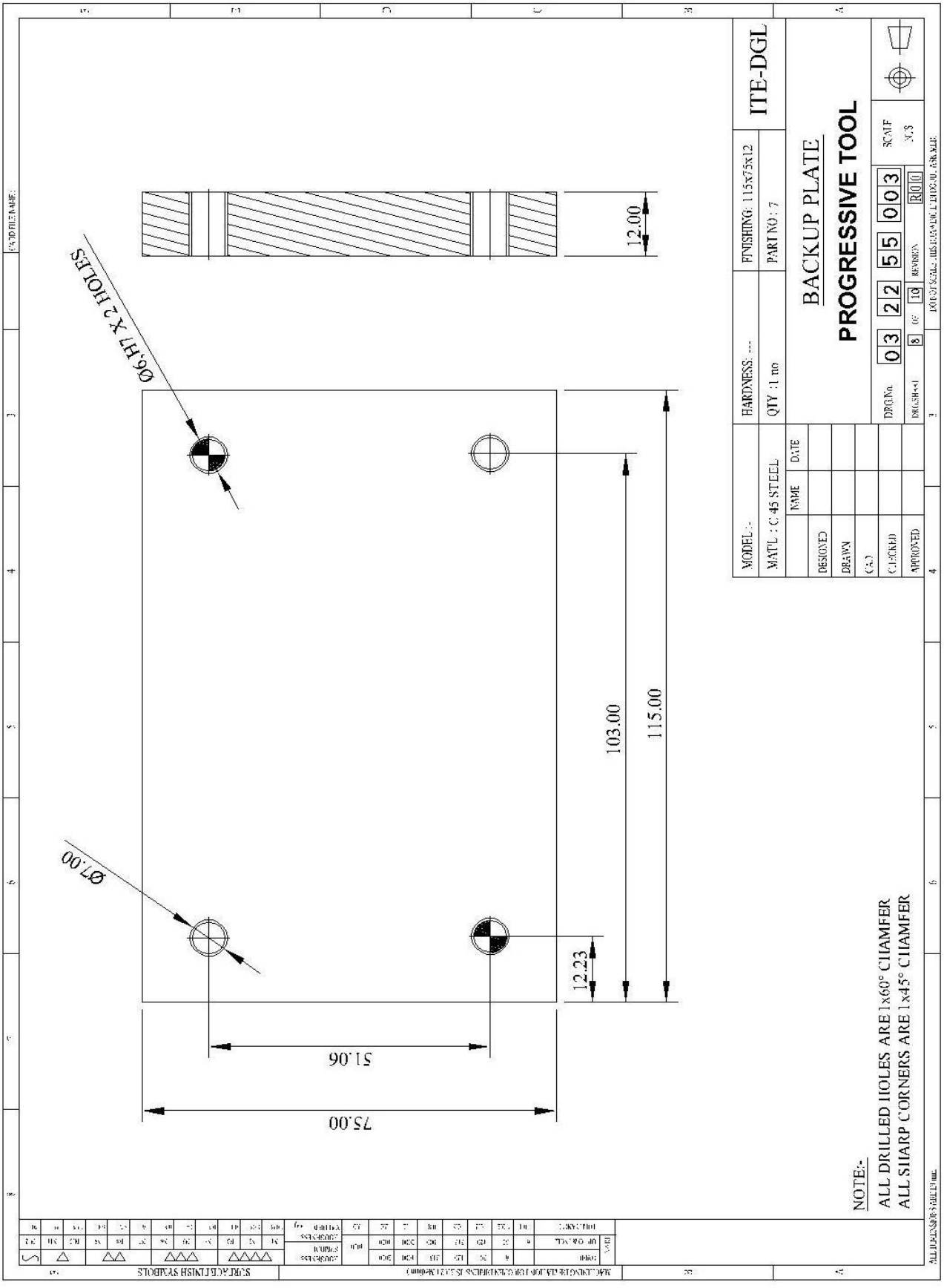

BOTTOM PLATE
PROGRESSIVE TOOL
ITE-DGL
MODEL :-
MATL : M.S
HARDNESS: ---
QTY : 1 no
FINISHING: 210x150x12
PART NO : 1
DRG.No. 03 22 55 003
SCALE NTS
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
2holes,Ø15+0.02
Ø0.010 M A
150.00
12.00
25.00
59.50
91.00
210.00
25.00
51.00

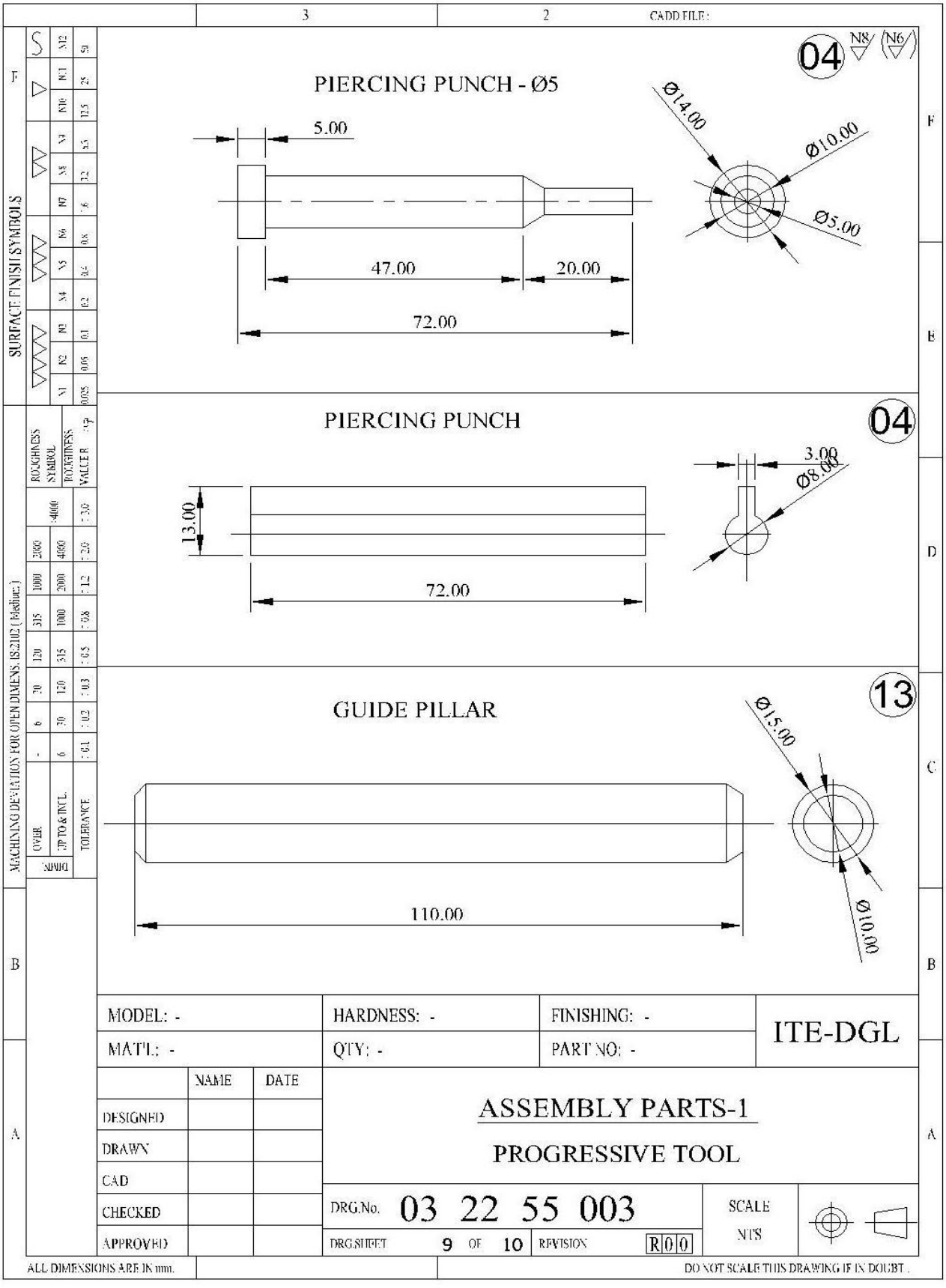

TOP PLATE
PROGRESSIVE TOOL
ITE-DGL
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
150.00
12.00
49.50
25.00
91.00
160.00
210.00
49.50
25.00
2holes,Ø15.00+0.02
Ø0.010 M A
A

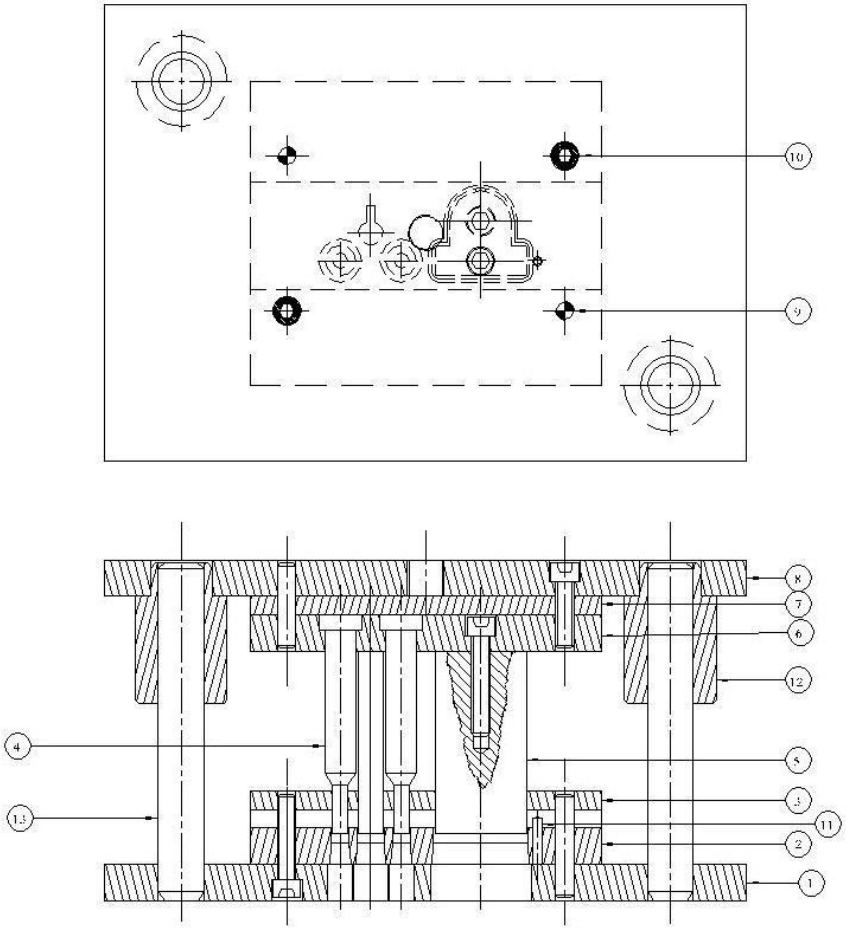

Ø6117x2110LES
Ø7X2110LES
5.00
12.00
12.00
31.00
41.00
51.00
74.00
103.00
115.00
12.00
28.50
37.50
41.50
63.00
75.00
PUNCH HOLDER
PROGRESSIVE TOOL
ITE-DGL
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


ITE-DGL
FINISHING: 115x75x12
PART NO: 3
HARDNESS: ---
QTY : 1 no
MODEL :-
MAT'L : OHNS
STRIPPER PLATE
PROGRESSIVE TOOL
DRG.No: 03 22 55 003
SCALE NTS
Ø6H7X2HOLES
M6X2HOLES
34.00
12.00
5.00
12.00
31.00
41.00
51.00
59.00
74.00
84.00
89.00
103.00
115.00
12.00
19.80
28.50
37.50
53.50
63.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
SURFACE FINISH SYMBOLS


Ø6I17x2IIOLES
Ø7X2IIOLES
5.00
12.00
12.00
31.00
41.00
51.00
59.00
74.00
84.00
89.00
93.50
103.00
115.00
12.00
28.50
37.50
63.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
MATL : HCHCR
HARDNESS: ---
QTY :1 no
FINISHING: 115x75x12
PART NO : 2
ITE-DGL
DIE PLATE
PROGRESSIVE TOOL
DRG No. 03 22 55 003
SCALE NTS
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED


ITE-DGL
BACKUP PLATE
PROGRESSIVE TOOL
MODEL :-
MATL : C 45 STEEL
HARDNESS: ---
QTY : 1 no
FINISHING: 115x75x12
PART NO : 7
DRG.No. 03 22 55 003
SCALE 3/1
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
Ø6.H7 X 2 HOLES
Ø7.00
12.00
103.00
115.00
12.23
51.06
75.00


3
2
CADD FILE :
04
N8
N6
PIERCING PUNCH - Ø5
5.00
Ø14.00
Ø10.00
Ø5.00
47.00
20.00
72.00
PIERCING PUNCH
04
3.00
Ø8.00
13.00
72.00
GUIDE PILLAR
13
Ø15.00
110.00
Ø10.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
MATL: -
QTY: -
PART NO: -
ITE-DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
PROGRESSIVE TOOL
DRG.No. 03 22 55 003
DRG.SHEET 9 OF 10
REVISION R00
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .



NOTE:

1.ALL DIMENSIONS ARE IN mm

2.PROVIDE PUNCH AND DIE CLEARANCE PROVIDE AS 0.01

3.THE PUNCH SHALL BE HARDENED AND TEMPERED AS 60-62 HRC

4.THE DIE PLATE SHALL BE HARDENED AS 60-62 HRC

5.AVOID SHARP CORNERS

6.FOR DIMENSIONS WITHOUT TOLERANCE SHALL BE PROVIDED AS ISO 2768-1

BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QUANTITY
13	GUIDE PILLAR	EN24 STEEL	2
12	GUIDE BUSH	EN24 STEEL	2
11	STOP PIN	STD	1
10	M6 ALLEN SCREW	STD	6
9	DOWEL PIN	STD	4
8	TOP PLATE	MILD STEEL	1
7	BACKUP PLATE	C45 STEEL	1
6	PUNCH HOLDER	OHNS	1
5	BLANKING PUNCH	A2 STEEL	1
4	PIERCING PUNCH	A2 STEEL	3
3	STRIPPER PLATE	OHNS	1
2	DIE PLATE	Heiker	1
1	BOTTOM PLATE	MILD STEEL	1

MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

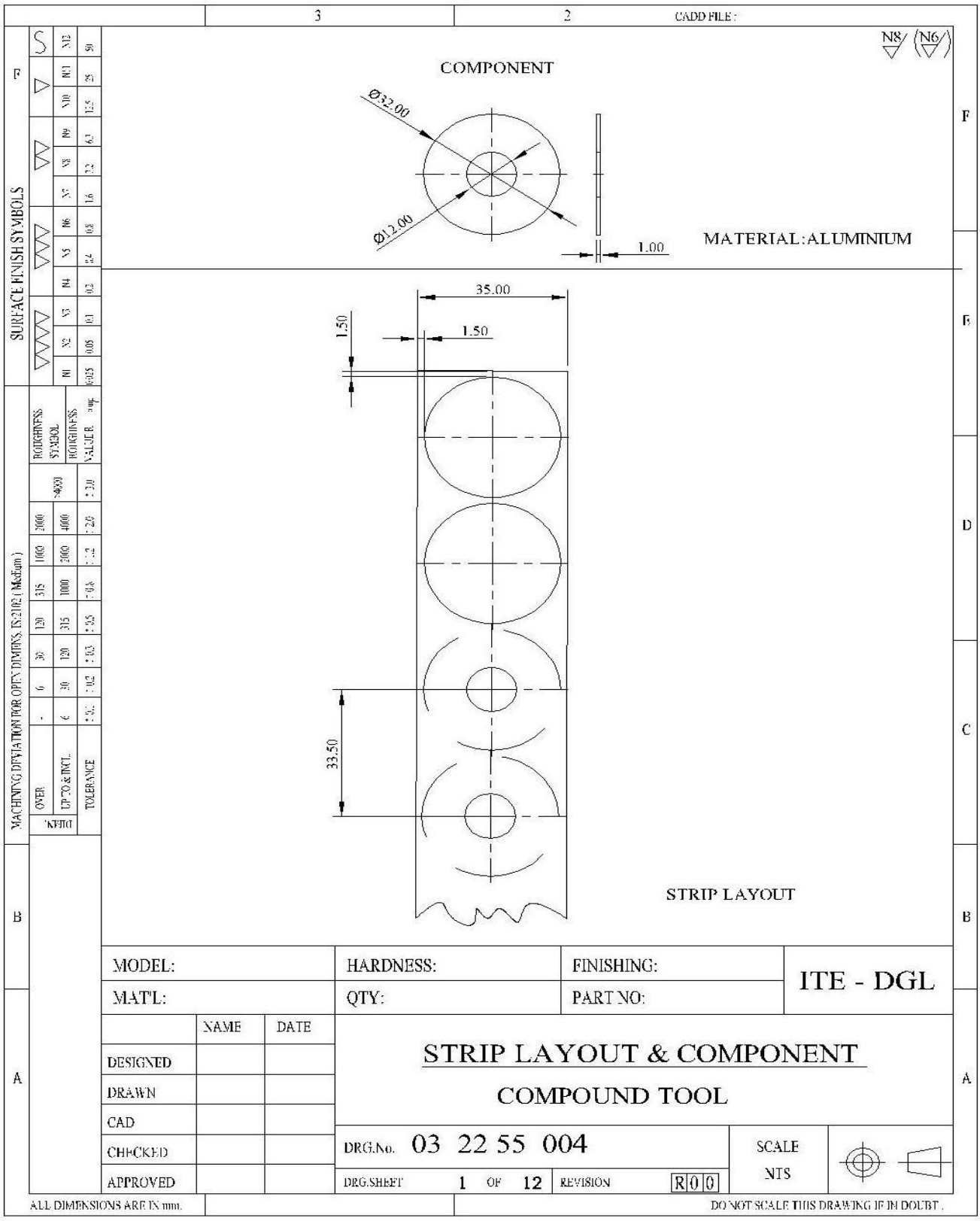
ASSEMBLY

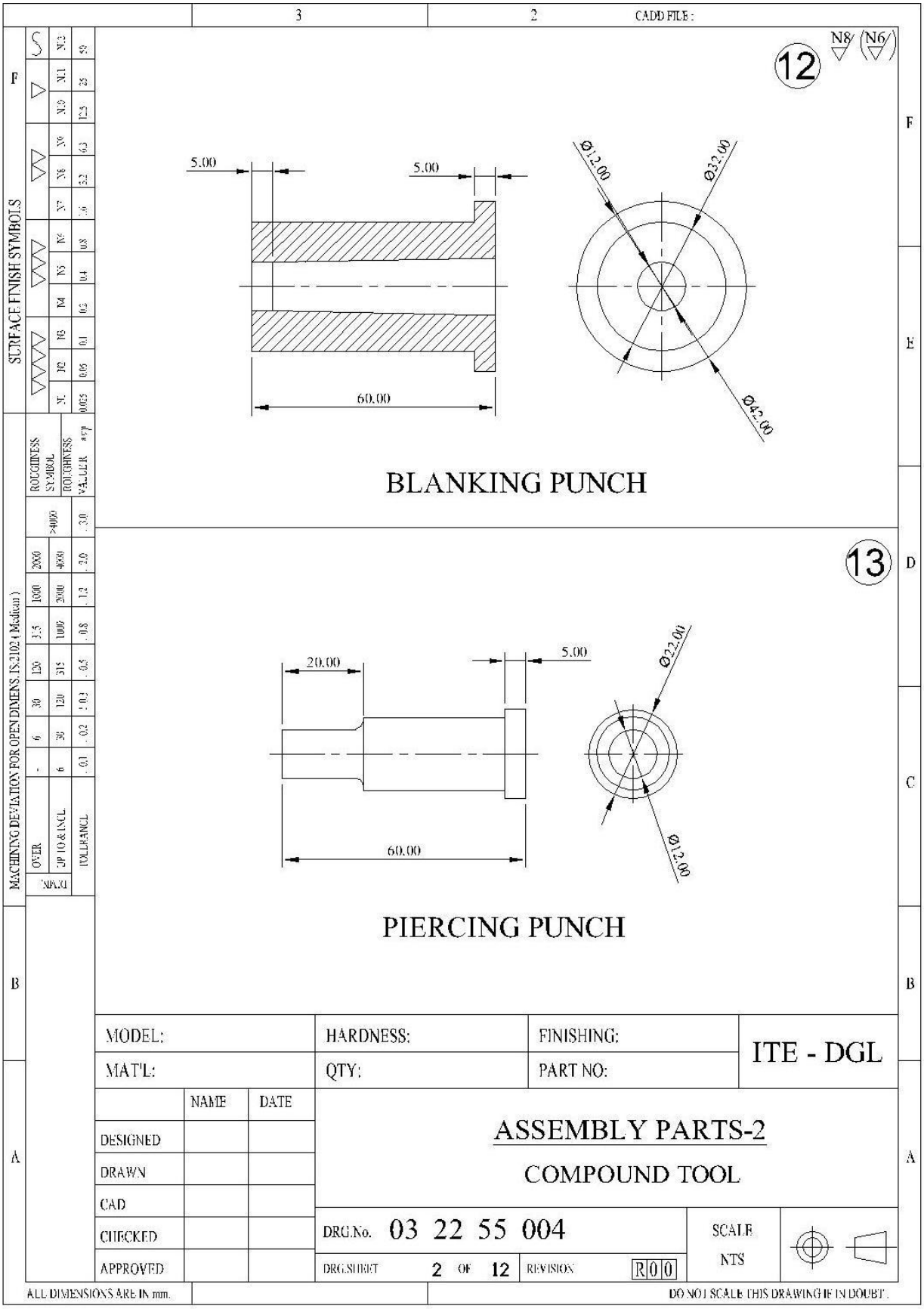
PROGRESSIVE TOOL

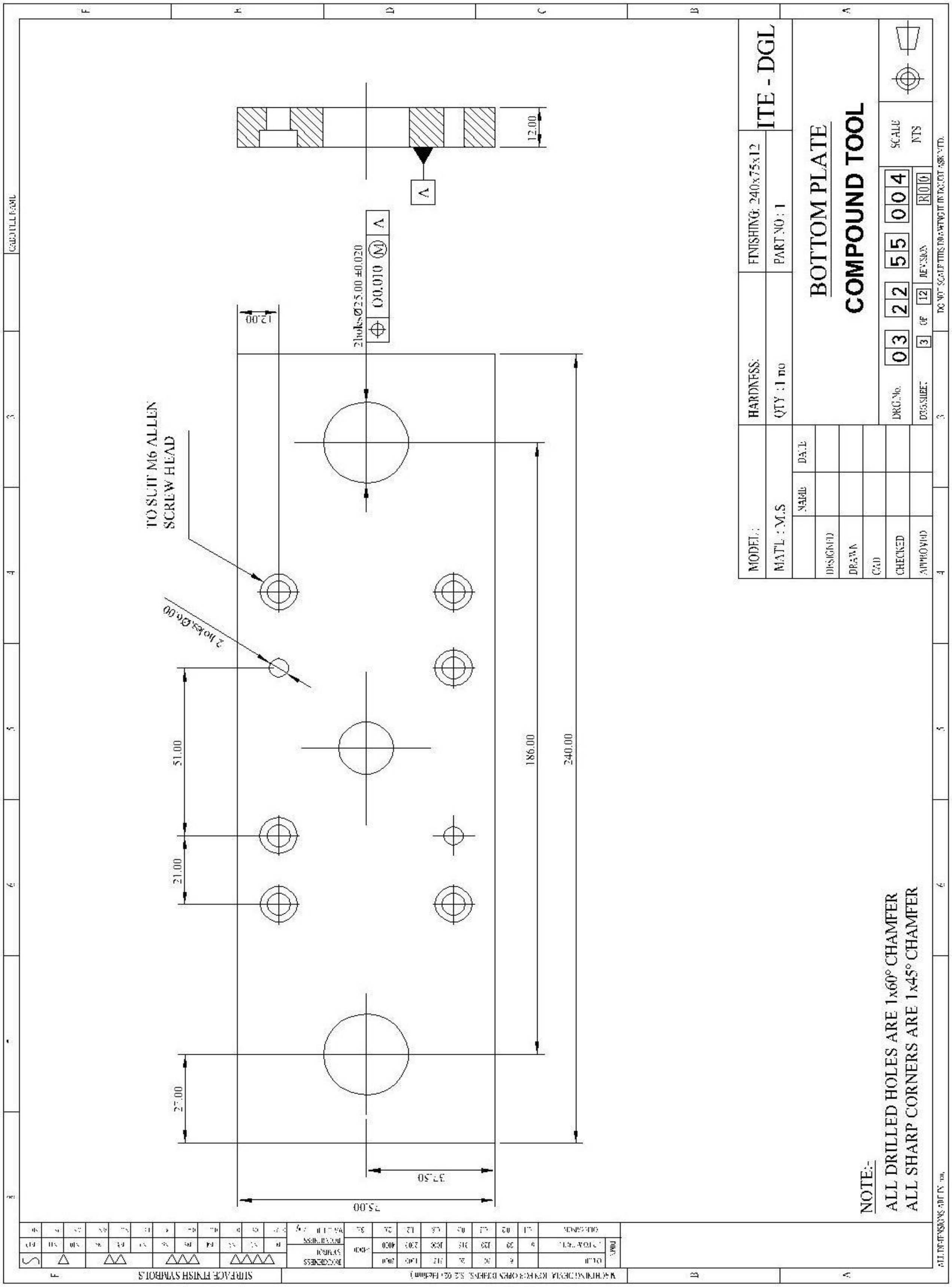
DRG No. 03 22 55 003 | SCALE M/S

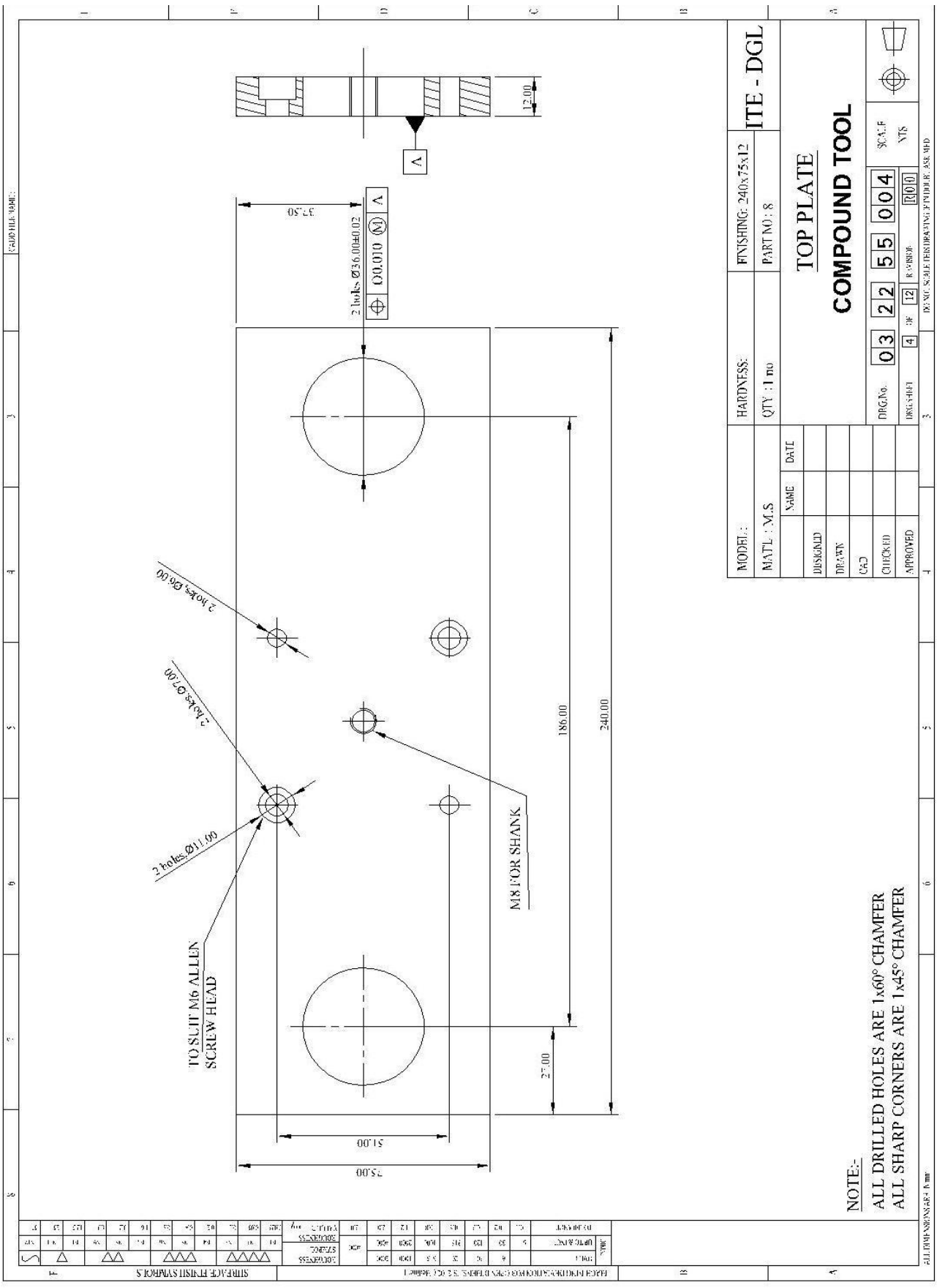
DRG SHEET 10 OF 10 | REVISION R00

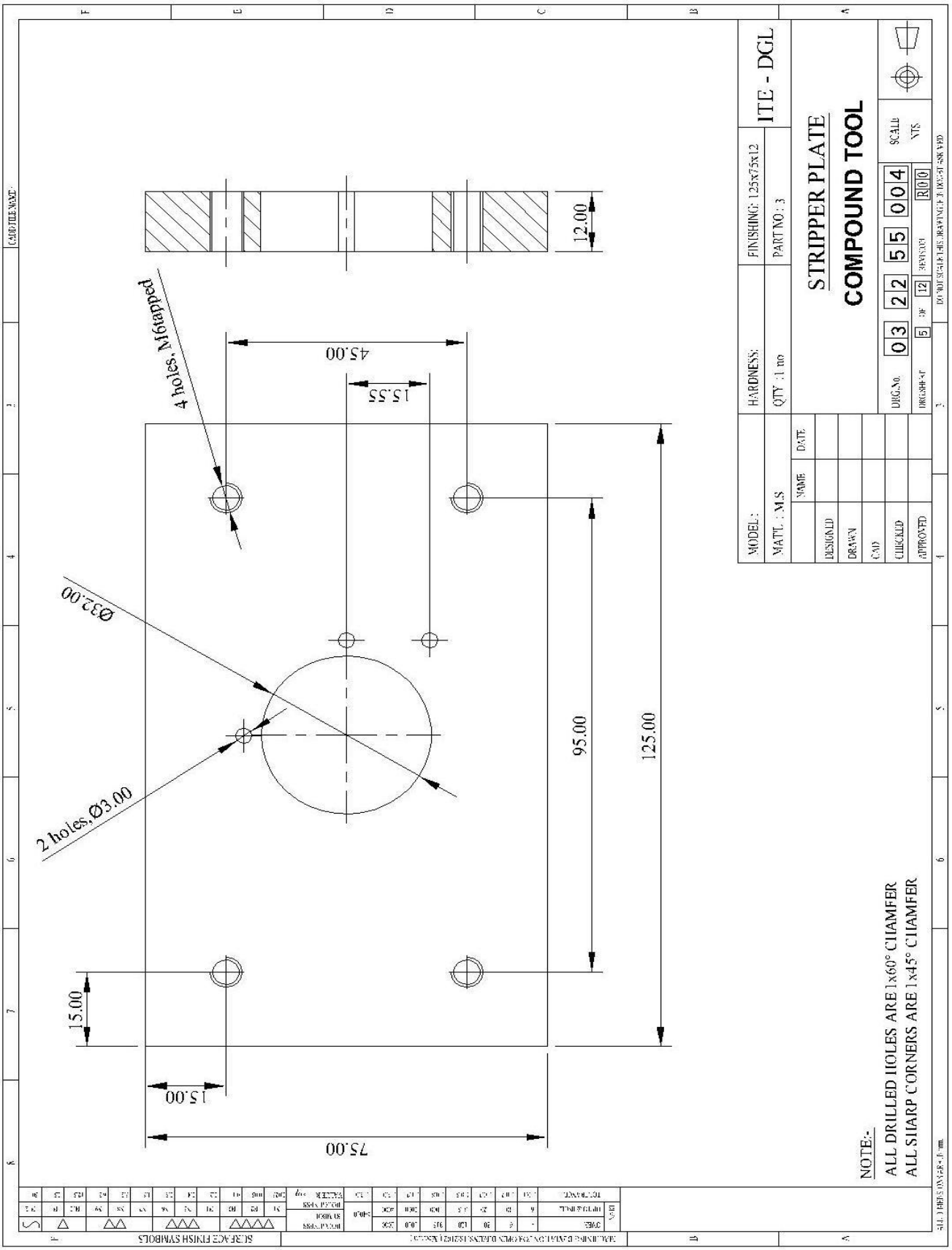
Exercise – IV Compound Tool

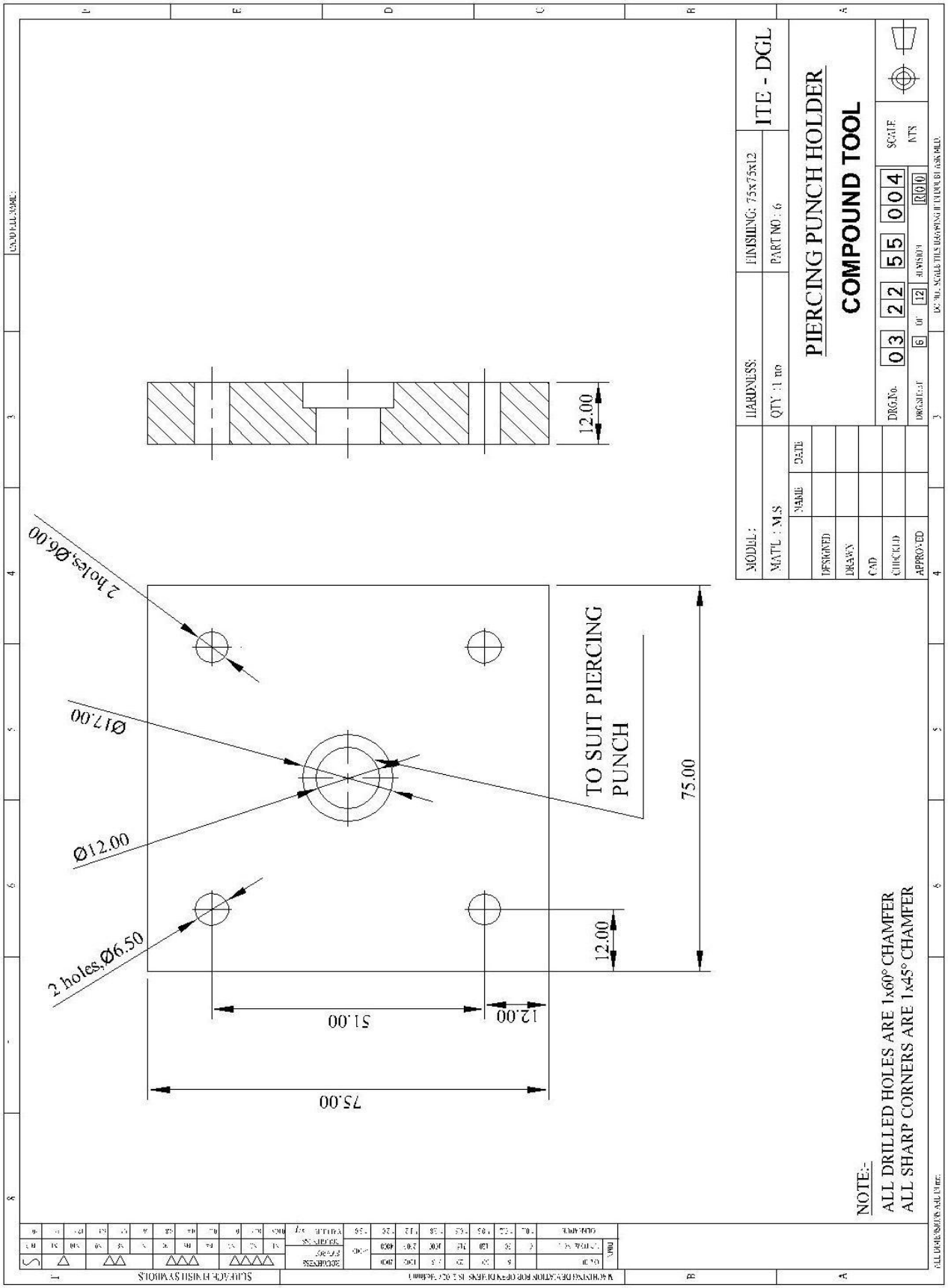


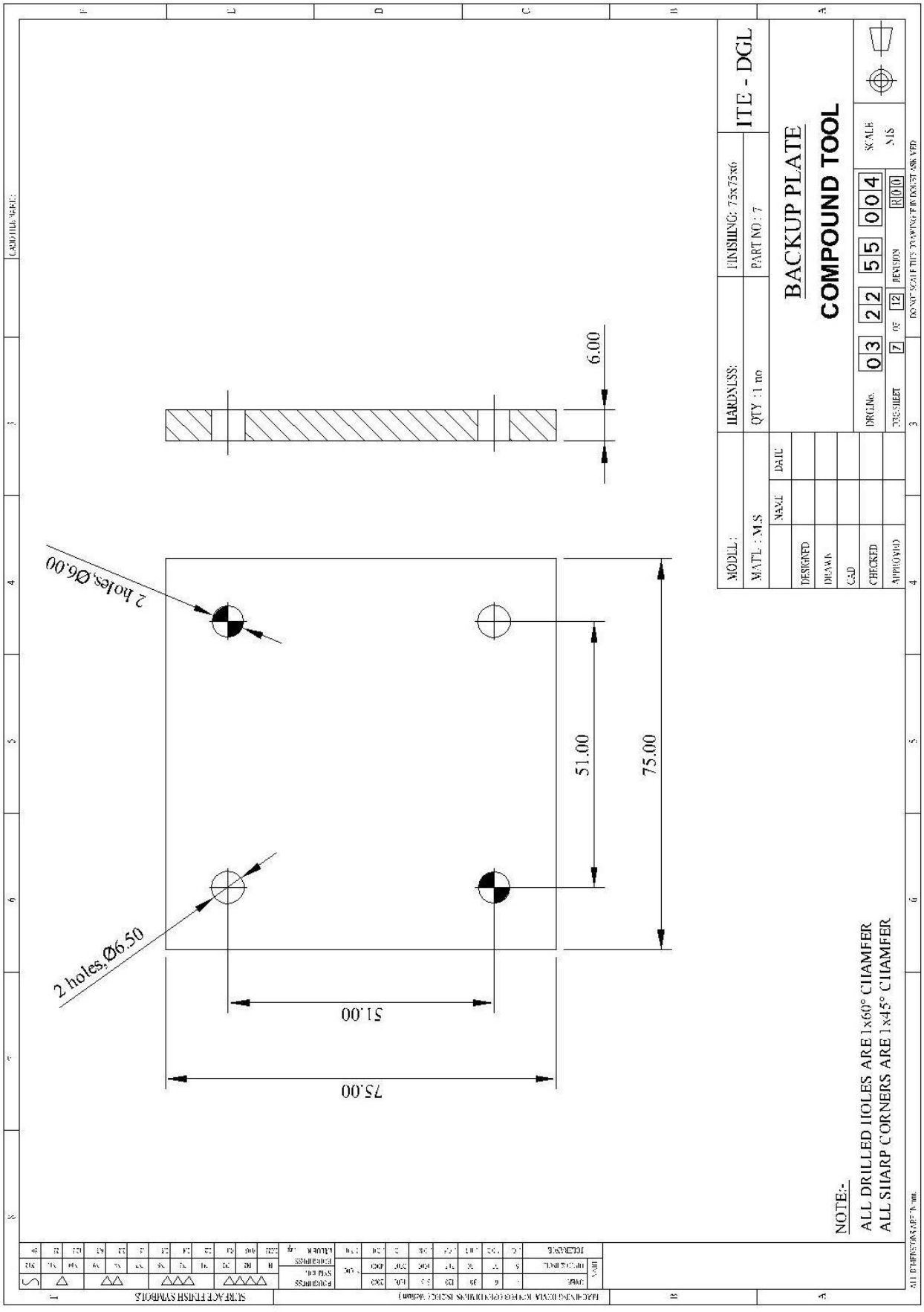

CADD FILE :
12
N8 (N6)
5.00
5.00
60.00
Ø12.00
Ø32.00
Ø42.00
BLANKING PUNCH
13
20.00
5.00
60.00
Ø22.00
Ø12.00
PIERCING PUNCH
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-2
COMPOUND TOOL
DRG.No. 03 22 55 004
DRG.SHEET 2 OF 12
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

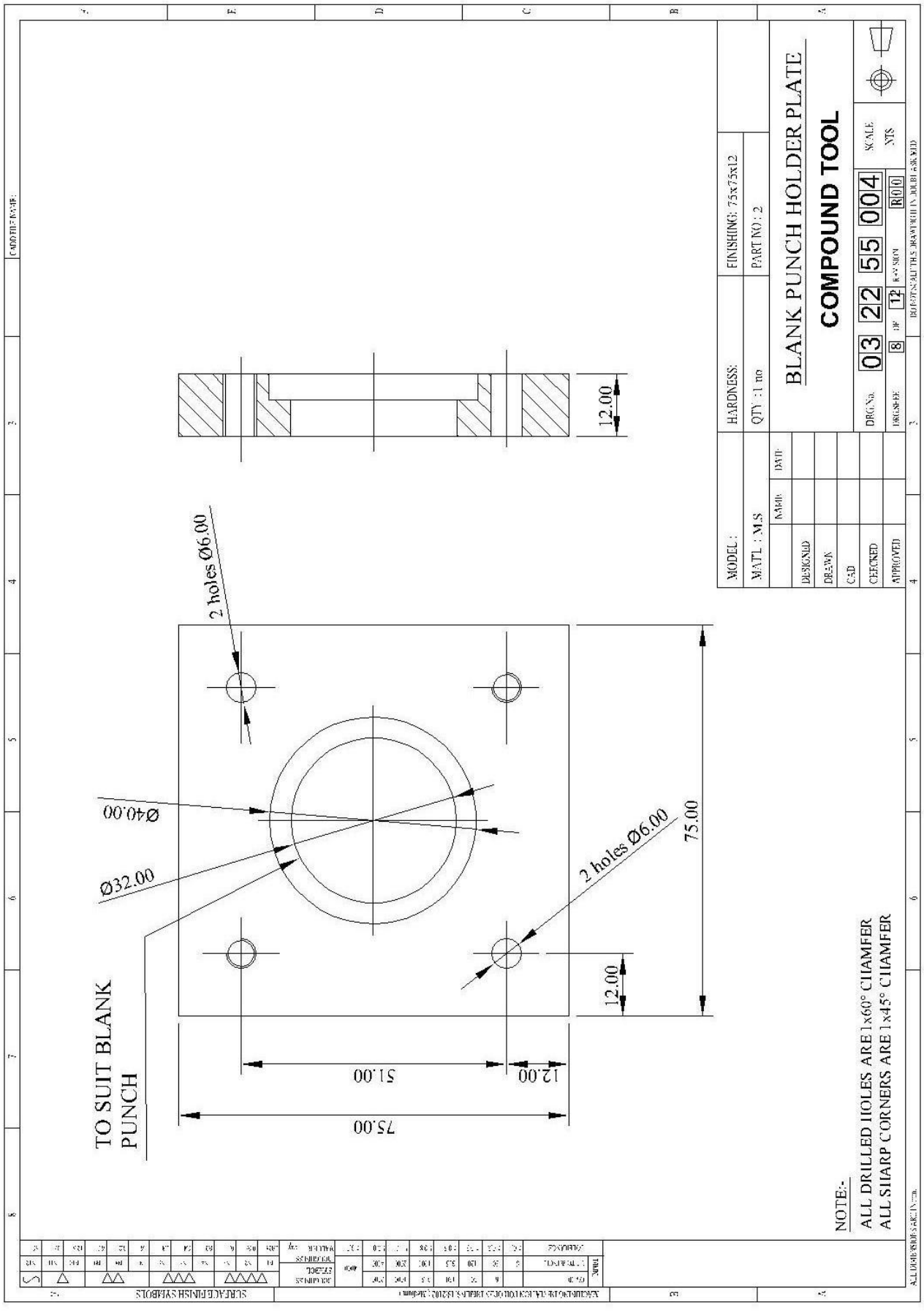

ITE - DGL
FINISHING: 240x75x12
PART NO: 1
HARDNESS:
QTY : 1 no
MODEL:
MAT'L : M.S
BOTTOM PLATE
COMPOUND TOOL
DRG.No. 03 22 55 004
SCALE
NTS
TO SUIT M6 ALLEN SCREW HEAD
2 holes Ø6.00
2holes Ø25.00 ±0.020
Ø0.010 Ⓜ A
12.00
51.00
21.00
27.00
186.00
240.00
37.50
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
SURFACE FINISH SYMBOLS

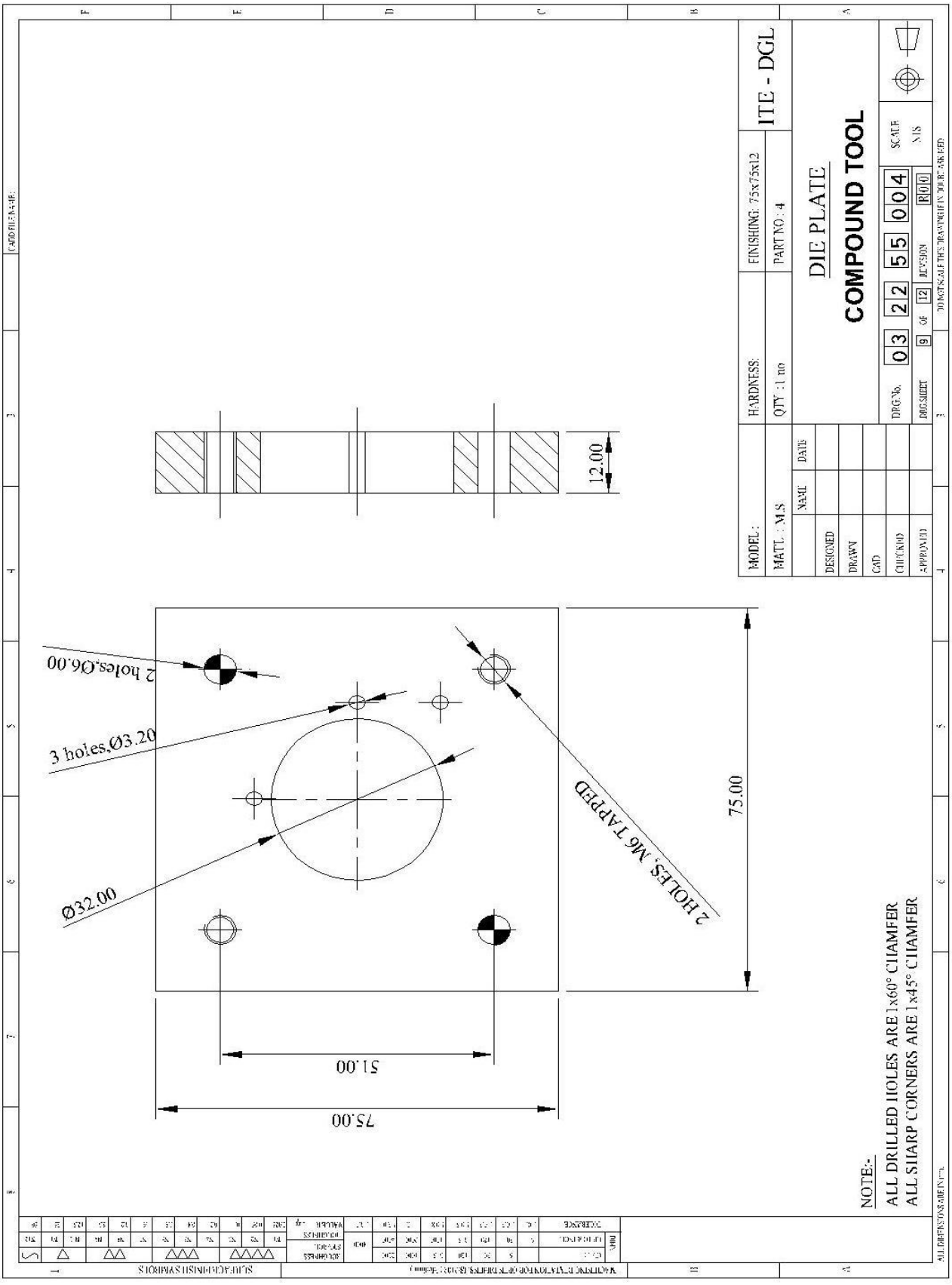

TOP PLATE
COMPOUND TOOL
ITE - DGL
FINISHING: 240x75x12
PART NO : 8
QTY : 1 no
MATL : M.S
MODEL :
HARDNESS:
DRG.No. 03 22 55 004
SCALE 1/1
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
M8 FOR SHANK
TO SUIT M6 ALLEN SCREW HEAD
2 holes Ø6.00
2 holes Ø7.00
2 holes Ø11.00
2 holes Ø36.00±0.02
Ø0.010 M A
186.00
240.00
27.00
51.00
75.00
37.50
12.00

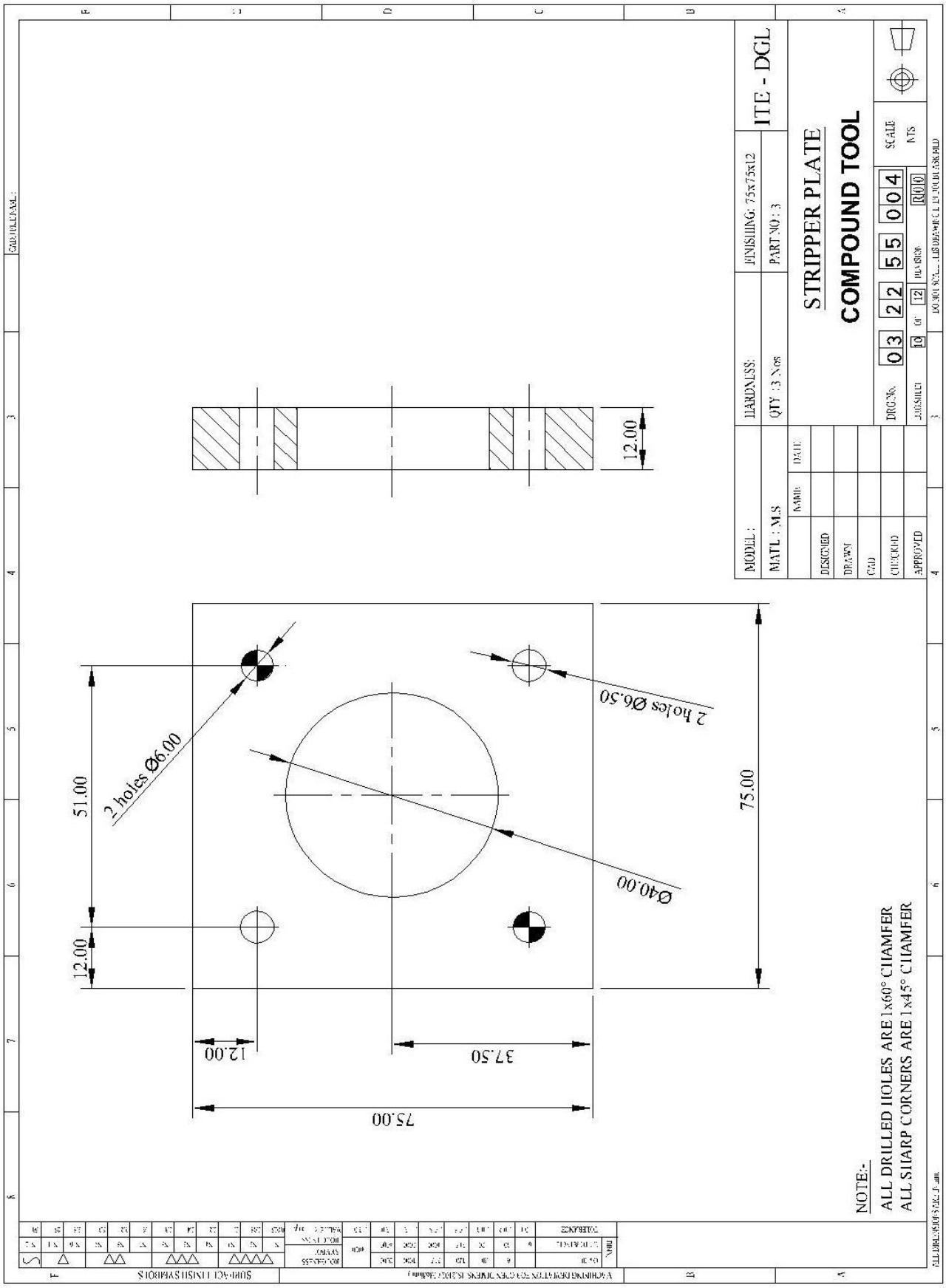

STRIPPER PLATE
COMPOUND TOOL
ITE - DGL
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 125x75x12
PART NO : 3
DRG.No. 03 22 55 004
SCALE VTS
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
NAME
DATE
4 holes, M6tapped
45.00
15.55
12.00
Ø32.00
2 holes, Ø3.00
95.00
125.00
15.00
15.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

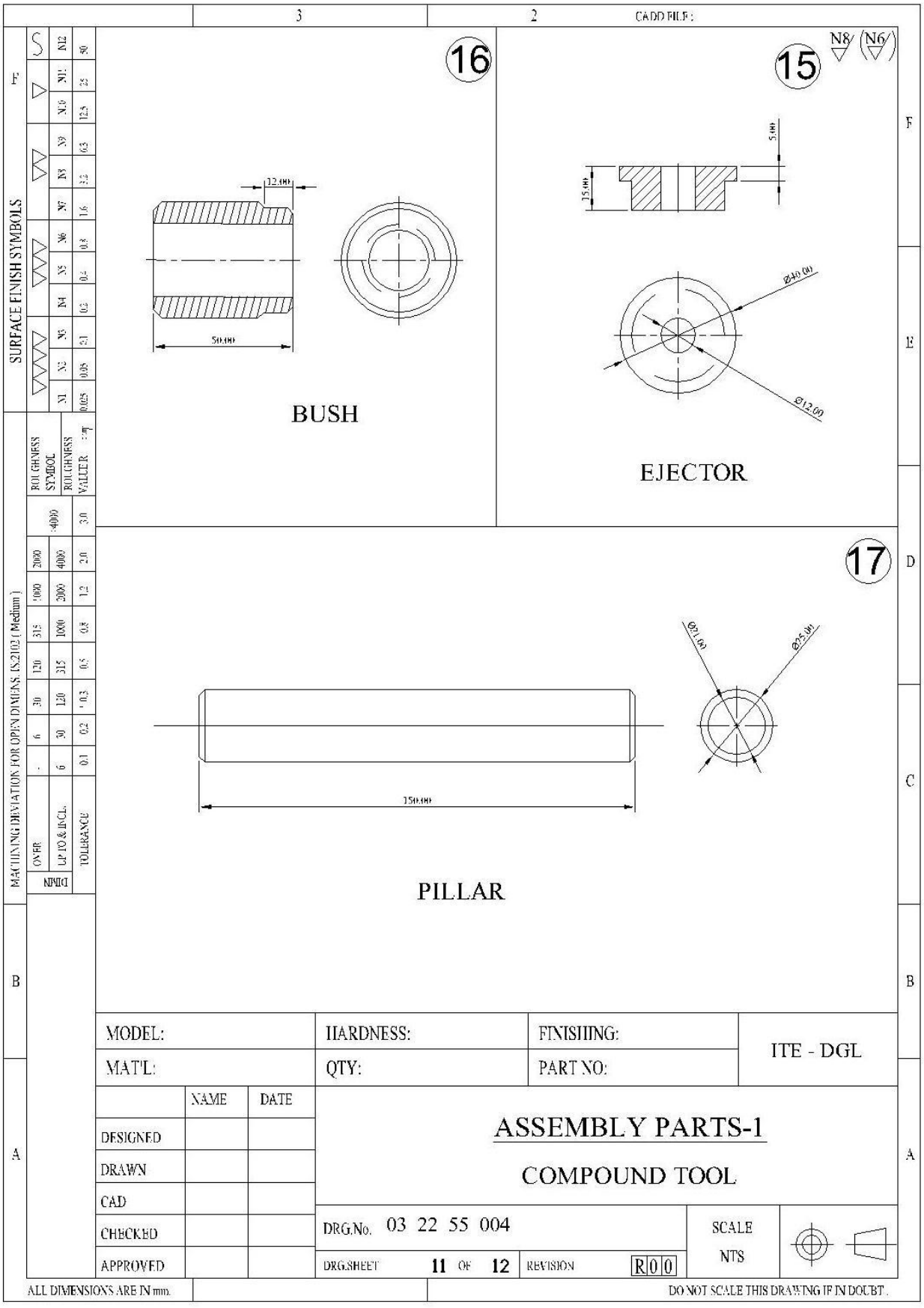

PIERCING PUNCH HOLDER
COMPOUND TOOL
ITE - DGL
DRG.No. 03 22 55 004
SCALE NTS
MATL : M.S
QTY : 1 no
PART NO : 6
2 holes,Ø6.00
Ø17.00
Ø12.00
2 holes,Ø6.50
TO SUIT PIERCING PUNCH
75.00
51.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


6.00
2 holes,Ø6.00
51.00
75.00
2 holes,Ø6.50
51.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x6
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : 7
BACKUP PLATE
COMPOUND TOOL
DESIGNED
DRAWN
CHECKED
APPROVED
DRG.No. 03 22 55 004
SCALE NIS
SHEET 7 OF 12
REVISION R00
DO NOT SCALE THIS DRAWING
SURFACE FINISH SYMBOLS

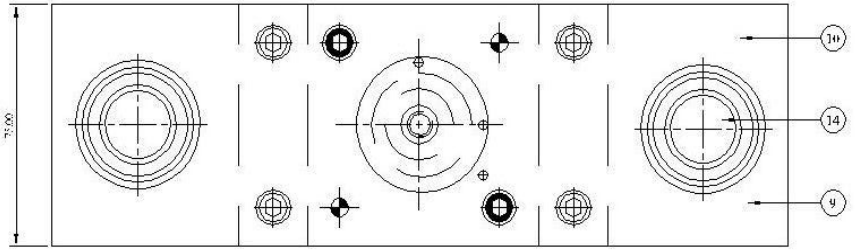

BLANK PUNCH HOLDER PLATE
COMPOUND TOOL
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 75x75x12
PART NO : 2
DRG.No. 03 22 55 004
SCALE NTS
2 holes Ø6.00
Ø40.00
Ø32.00
TO SUIT BLANK PUNCH
75.00
51.00
12.00
12.00
2 holes Ø6.00
75.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

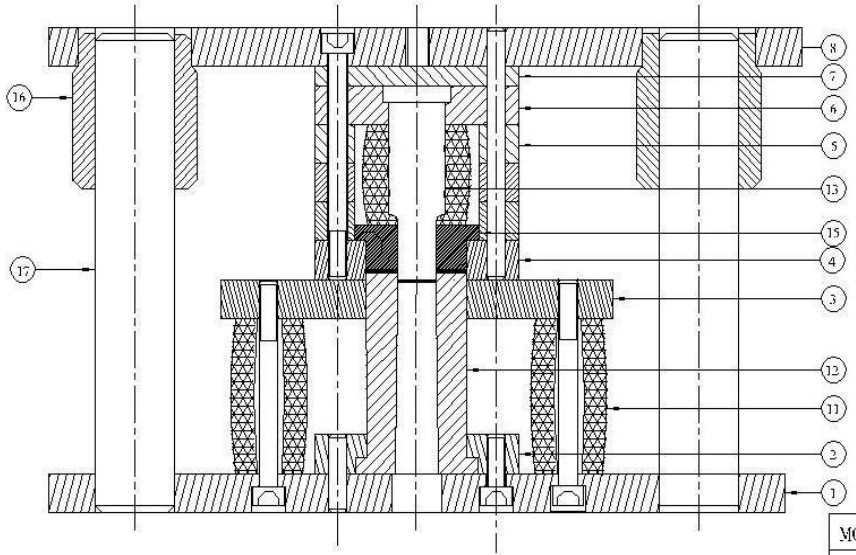

DIE PLATE
COMPOUND TOOL
ITE - DGL
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 75x75x12
PART NO : 4
DRG No. 03 22 55 004
SCALE NTS
DESIGNED
DRAWN
CHECKED
APPROVED
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
12.00
75.00
51.00
75.00
Ø32.00
3 holes,Ø3.20
2 holes,Ø6.00
2 HOLES, M6 TAPPED


STRIPPER PLATE
COMPOUND TOOL
ITE - DGL
MATL : M.S
QTY : 3 Nos
PART NO : 3
FINISHING: 75x75x12
DRG No. 03 22 55 004
SCALE NTS
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
2 holes Ø6.00
2 holes Ø6.50
Ø40.00
51.00
12.00
75.00
37.50
12.00
75.00
12.00


SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 [Medium]
16
BUSH
15
EJECTOR
17
PILLAR
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
COMPOUND TOOL
DRG.No. 03 22 55 004
SCALE NTS
DRG.SHEET 11 OF 12
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

PLAN





SECTIONAL ELEVATION

NOTE

1. ALL DIMENSIONS ARE IN mm.
2. PROVIDE PUNCH DIE CLEARANCE PERSIDE AS 0.001
3. THE DIE PLATE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC
4. THE PUNCH SHALL BE HARDENED TO 60-62 HRC
5. AVOID SHARP CORNERS . 3 X 45° CHAMFER
6. FOR DIMENSIONS WITHOUT TOLERANCE SHALL BE PROVIDED AS ISO 2768-1

BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QUANTITY
17	PILLER	M.S	2
16	BUSH	M.S	2
15	EJECTOR	M.S	1
14	STOP PIN	M.S	2
13	PIERCING PUNCH	M.S	1
12	BLANKING PUNCH	M.S	1
11	PU RUBBER	PU	3
10	DOWELL Ø6	STD	4
9	ALLEN SCREW M6	STD	8
8	TOP PLATE	M.S	1
7	BACKUP PLATE	M.S	1
6	PIERCING PUNCH HOLDER	M.S	1
5	SPACER PLATE	M.S	3
4	DIE PLATE	M.S	1
3	STRIPPER PLATE	M.S	1
2	BLANKING PUNCH HOLDER	M.S	1
1	BOTTOM PLATE	M.S	1

MODEL :		HARDNESS:	FINISHING:
MATL :		QTY :	PART NO :

ITE - DGL

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

COMPOUND TOOL

DRG.No. 03 22 55 004

SCALE: NTS

DRGSHEET 12 OF 12 REVISION R00

ALL DIMENSIONS ARE IN mm. DO NOT SCALE THIS DRAWING UNLESS ASKED

DIRECTORATE OF TECHNICAL EDUCATION

DETAILS OF THE EQUIPMENTS

NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	THIRD
SEMESTER	V
NAME OF THE LABORATORY	32255 PRESS TOOLS - I PRACTICAL

S.NO	LIST OF THE EQUIPMENTS WITH SPECIFICATIONS REMARKS, IF ANY	QUANTITY REQUIRED
1	Centre Lathe, 4 ½' bed length	5
2	Drilling machine	2
3	Shaping machine, stroke length 300mm	2
4	Vertical milling machine	2
5	Surface grinding machine	2
6	Bench vice	10
7	Fitting file set	10
8	Tap set	4
9	Surface plate	2
10	Vernier height gauge 0-250mm	2
11	Dial test indicator with magnetic stand	2
12	Angle plate	2
13	Mechanical power press (15tons- 100 tons)	1
14.	Tool maker’s straight edge – 150 mm	1
15	Digital Micrometer – 0.-25mm range, 0.001mm least count	3

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

32256 – JIGS AND FIXTURES PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32256
Semester : V
Subject Title : **JIGS AND FIXTURES PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 15 weeks

SUBJECT	Instructions		Examination			
			Marks			Duration (Hrs)
	Hours/ Week	Hours/ Semester	Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
Jigs and Fixtures Practical	4	60	25	75	100	16

OBJECTIVES :

- Manufacture of template type drill jig
- Manufacture of Channel drill jig and indexing drill jig
- Manufacture of milling fixture
- Manufacture of inspection fixture
- Manufacture of welding fixture
- Use different machine tool in Manufacture of jigs and fixtures.

A. Manufacture of following Jigs

1. Template drill jig
2. Channel drill jig
3. Indexing drill jig

B. Manufacture of following Fixtures

4. Milling Fixture
5. Inspection Fixture
6. Welding Fixture

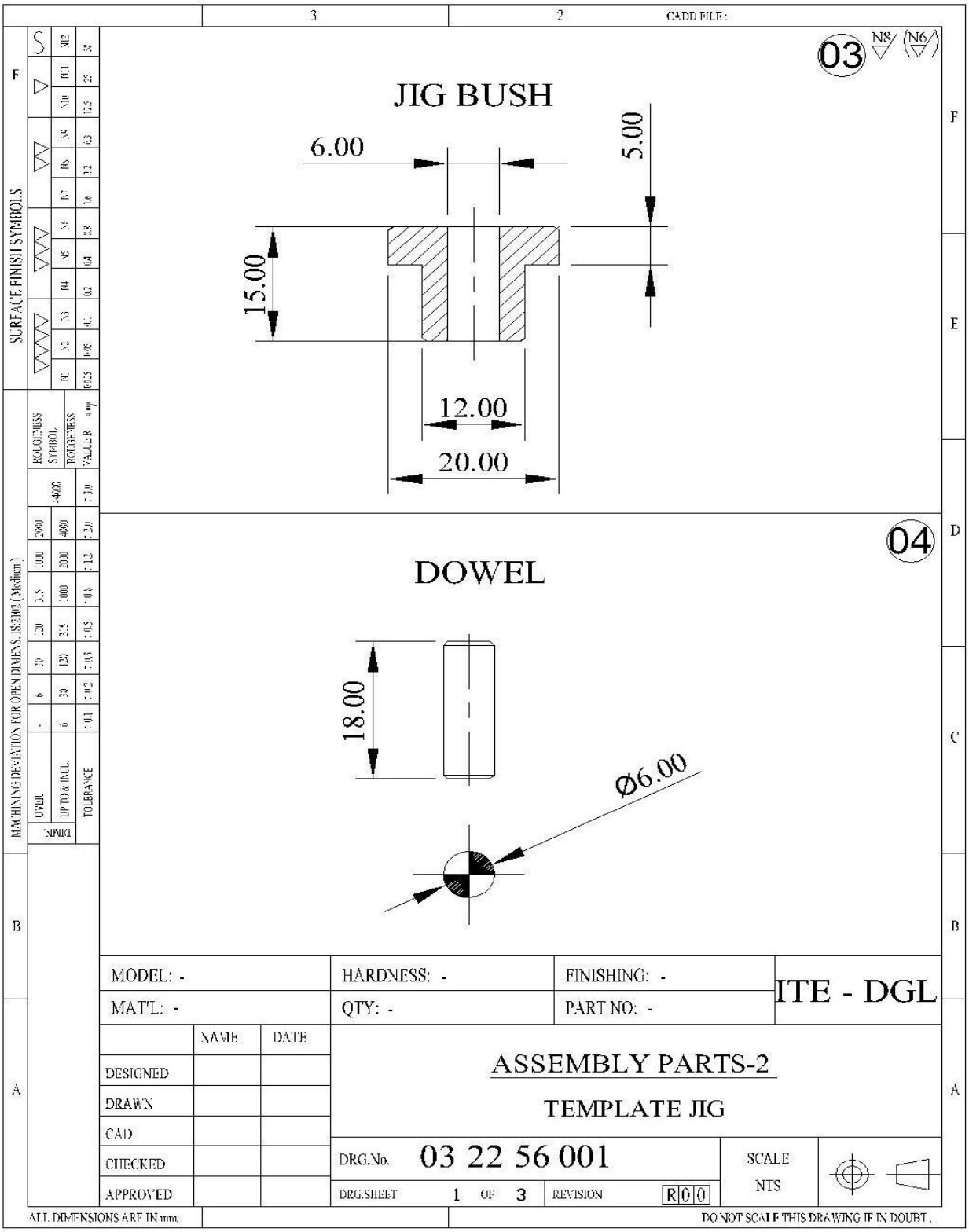
Note:-

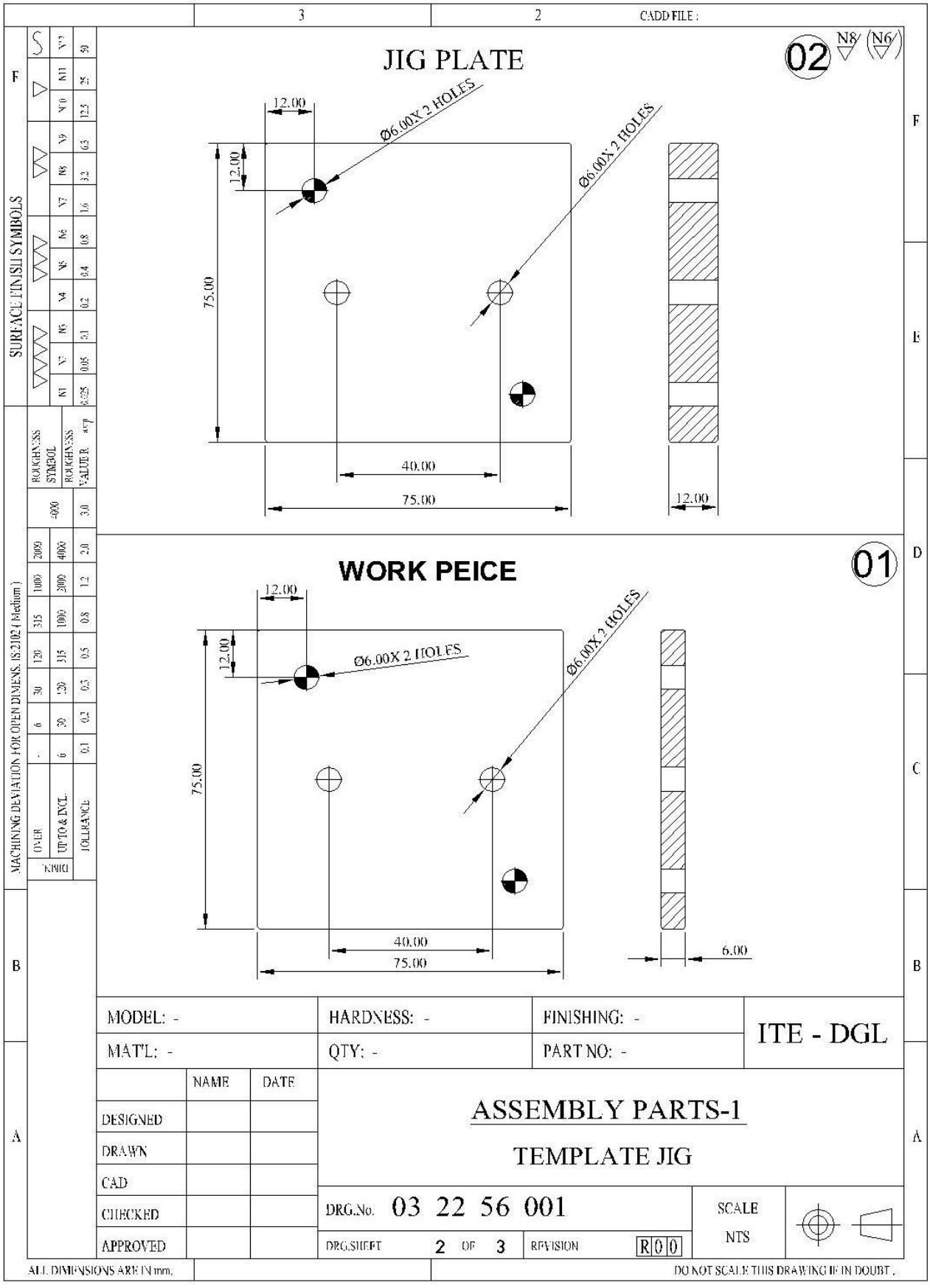
1. Batch size should not be more than 5 students for class work.
2. For examination, exercise Should be given to students individually and not in batches.
3. The examination duration is 16 hours.
4. Students should be trained in setting the Jig/Fixture on the machine tool , to make necessary adjustments, trial production using the tool fabricated by them and rectification of tool defects if any.
5. For Board examination any one of the above tool (slno 1 to 6) is to be manufactured , fitted in the machine tool and trial production should be taken. The evaluation of the performance should be based on the component dimensions and finish obtained from the Jig / Fixture manufactured by the student during the 16 hours examination.

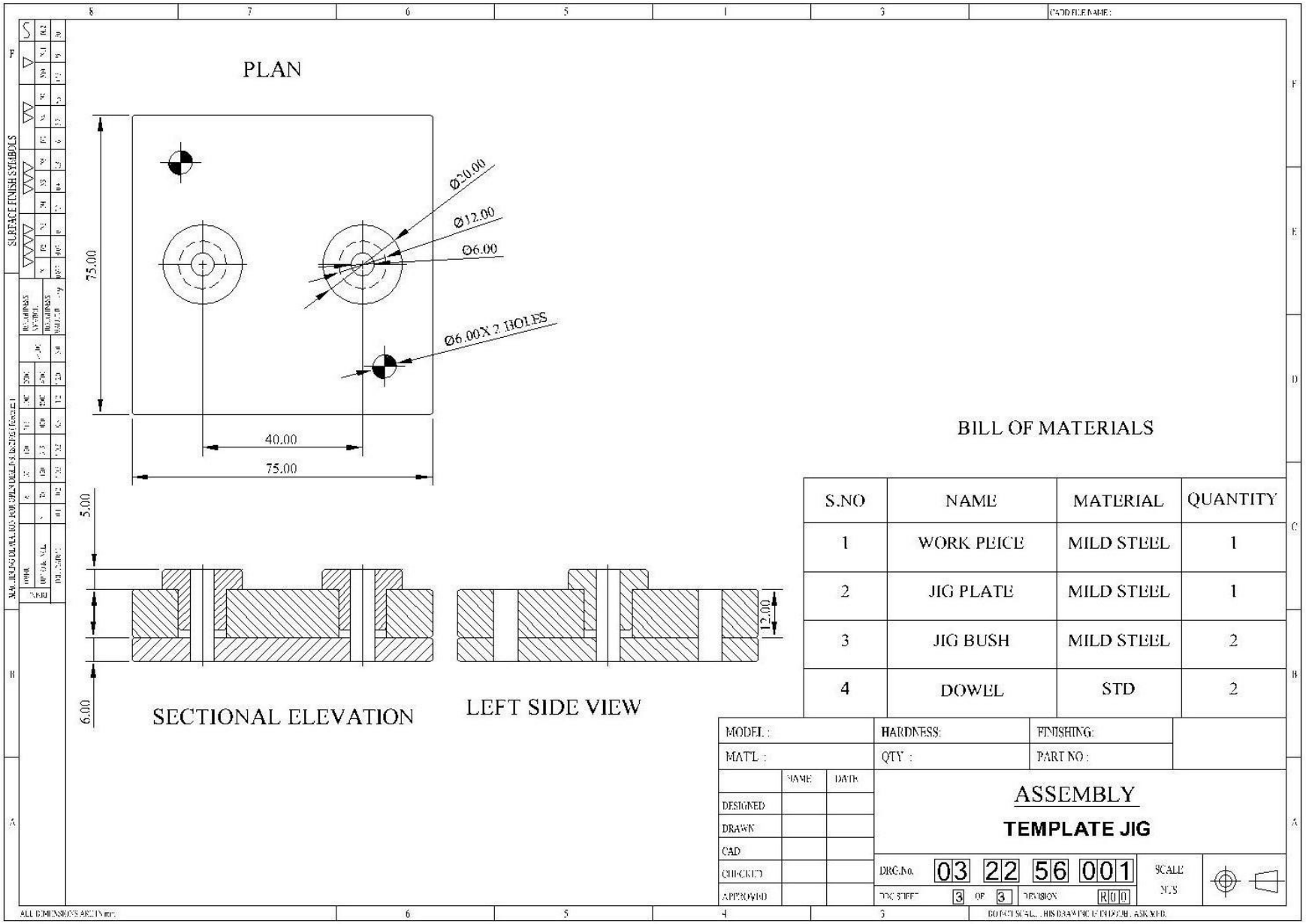
SCHEME OF EXAMINATION:

Manufacture of Jig / Fixture	-	25marks
Tool finish	-	25 marks
Component finish / accuracy	-	10 marks
Tool setting & trial production	-	10 Marks
Viva Voce	-	05 Marks
Total	-	75 Marks

Exercise – I Template Jig




CADD FILE :
JIG PLATE
02
N8
(N6)
12.00
Ø6.00X 2 HOLES
12.00
Ø6.00X 2 HOLES
75.00
40.00
75.00
12.00
WORK PEICE
01
12.00
Ø6.00X 2 HOLES
12.00
Ø6.00X 2 HOLES
75.00
40.00
75.00
6.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. (IS:2102-1 Medium)
MODEL: -
HARDNESS: -
FINISHING: -
ITE - DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
TEMPLATE JIG
DRG.No. 03 22 56 001
SCALE
NTS
DRG.SHEET 2 OF 3
REVISION R 0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .



BILL OF MATERIALS

S.NO	NAME	MATERIAL	QUANTITY
1	WORK PEICE	MILD STEEL	1
2	JIG PLATE	MILD STEEL	1
3	JIG BUSH	MILD STEEL	2
4	DOWEL	STD	2

MODEL :		HARDNESS:	FINISHING:
MATL :		QTY :	PART NO :

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

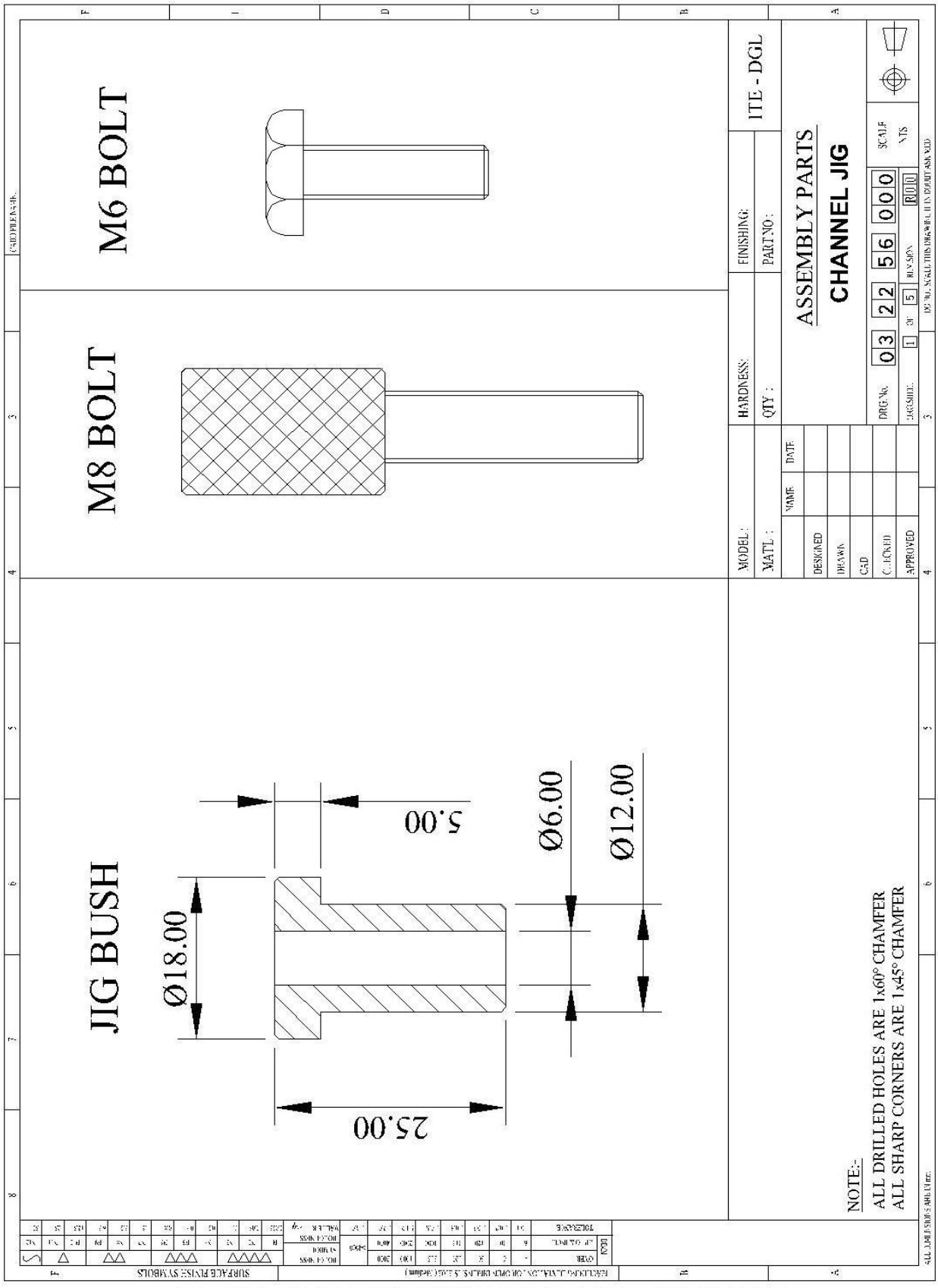
ASSEMBLY

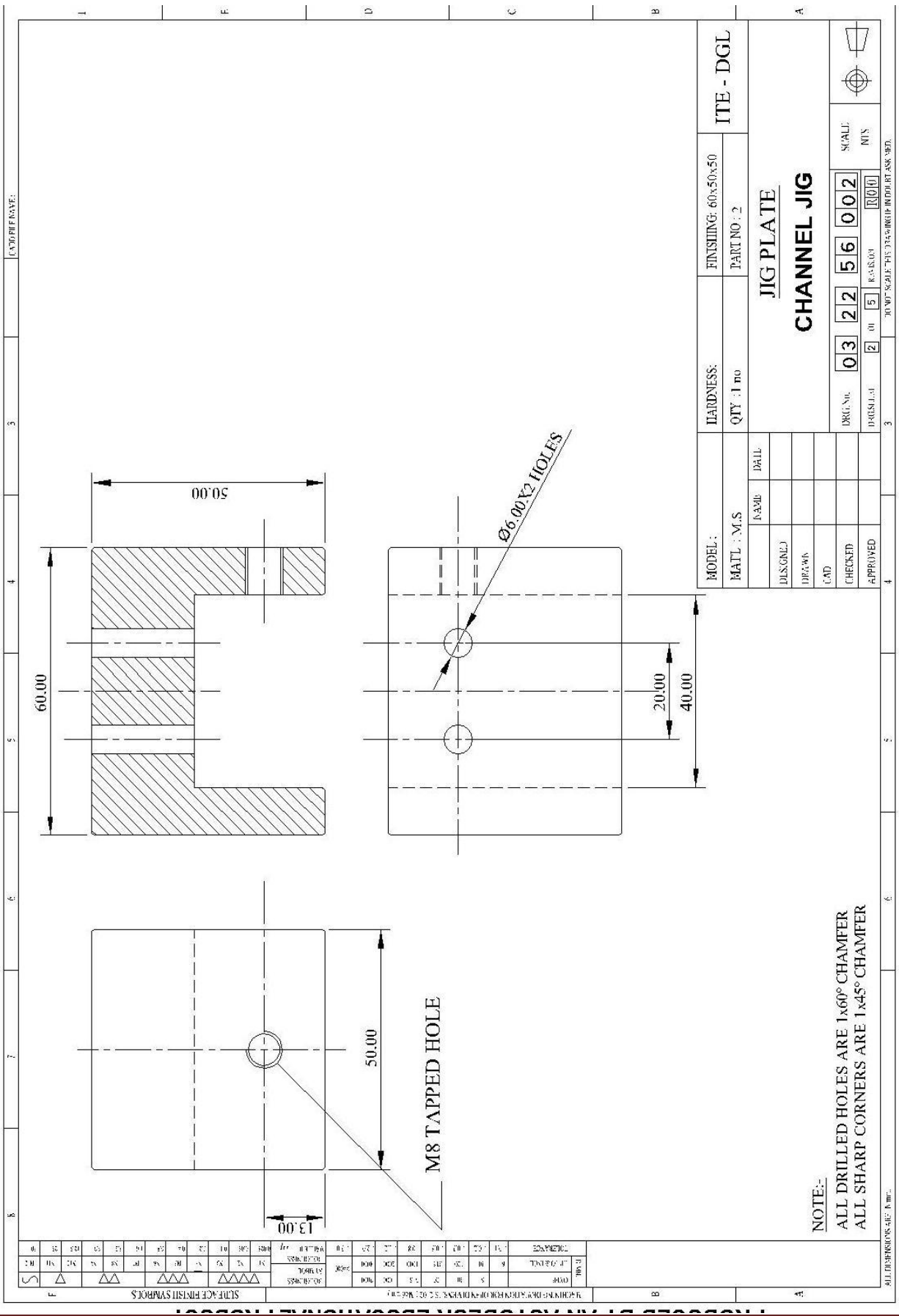
TEMPLATE JIG

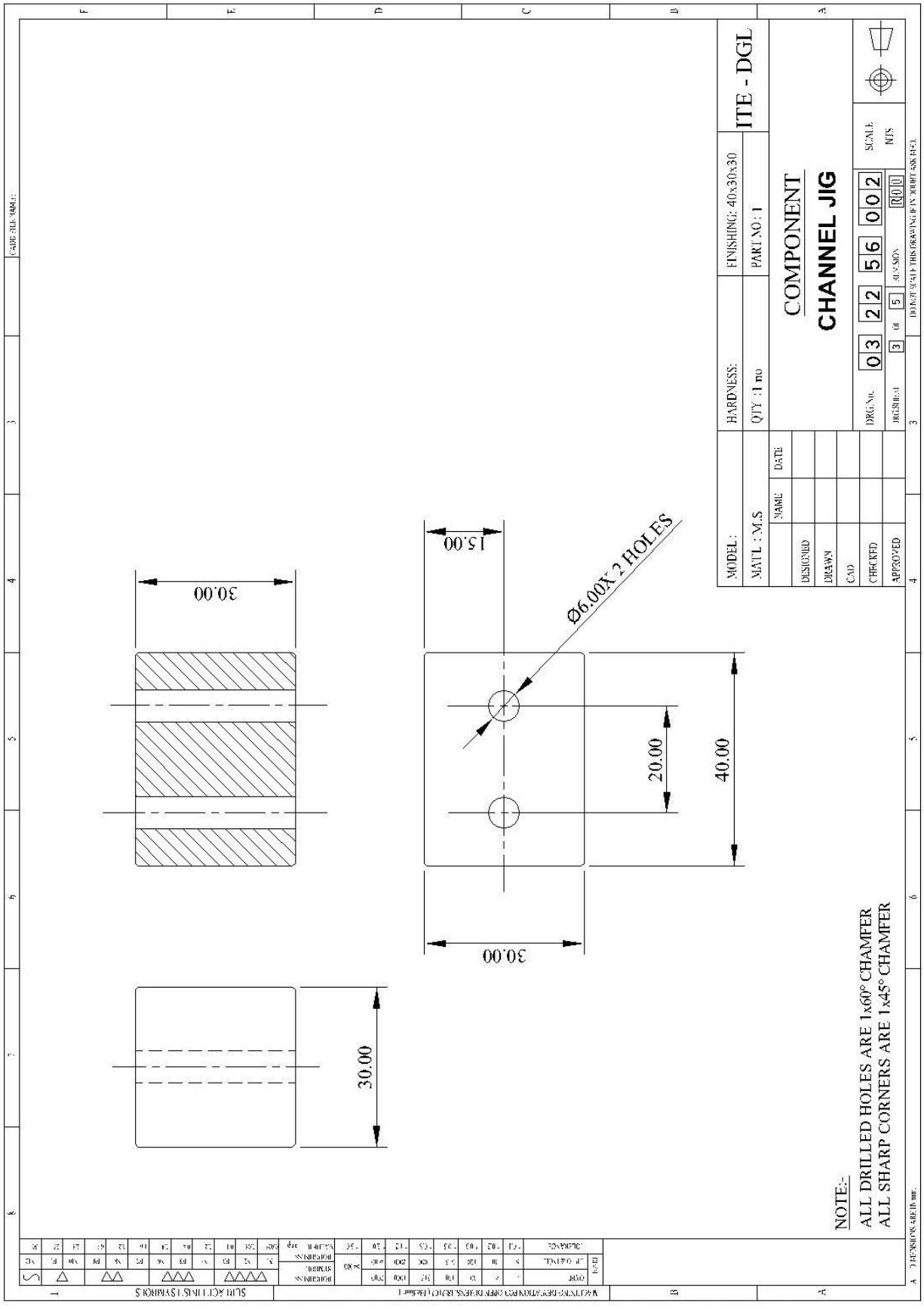
DRG.No. 03 22 56 001 SCALE NTS

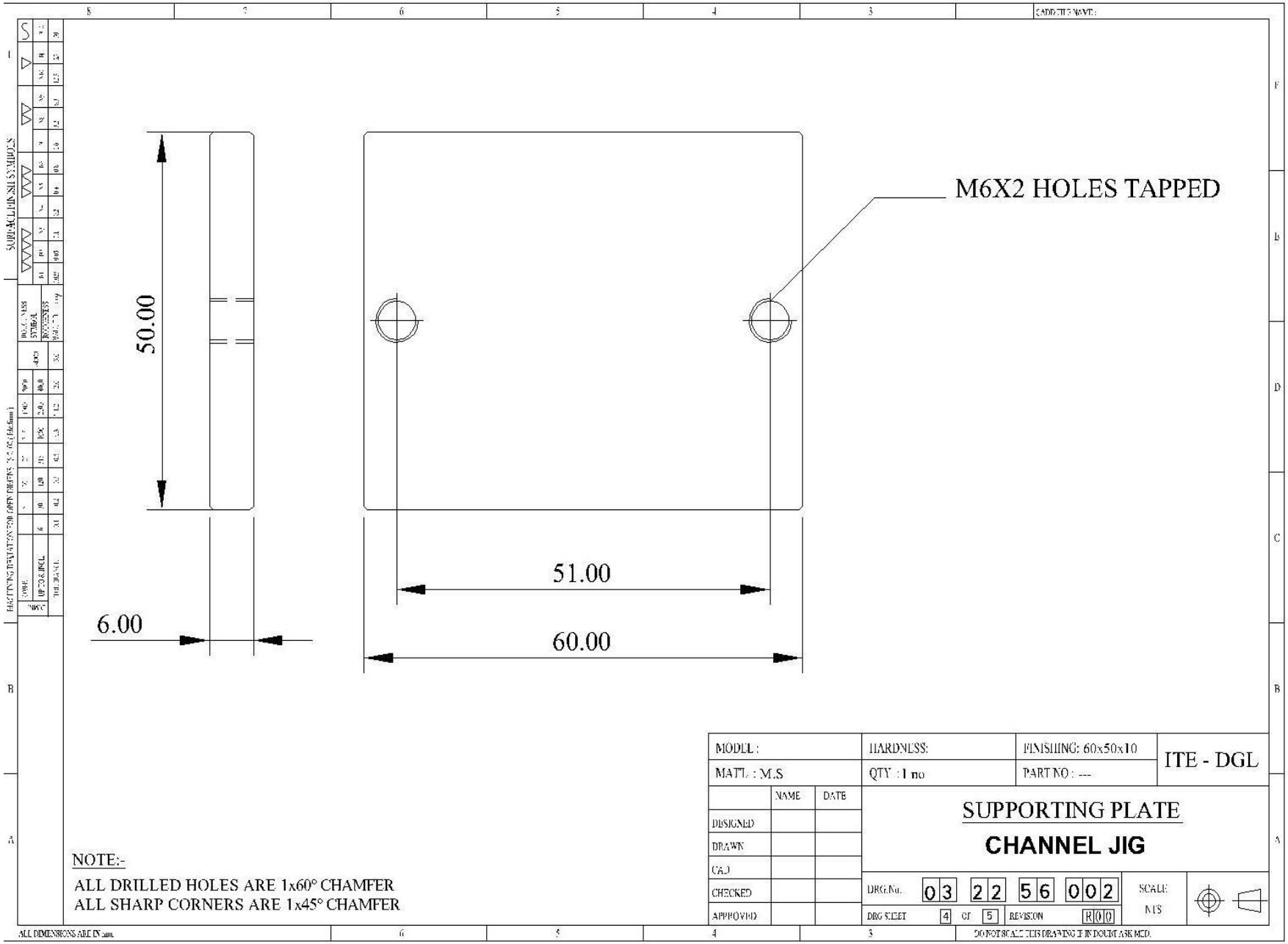
SHEET 3 OF 3 REVISION R0 0

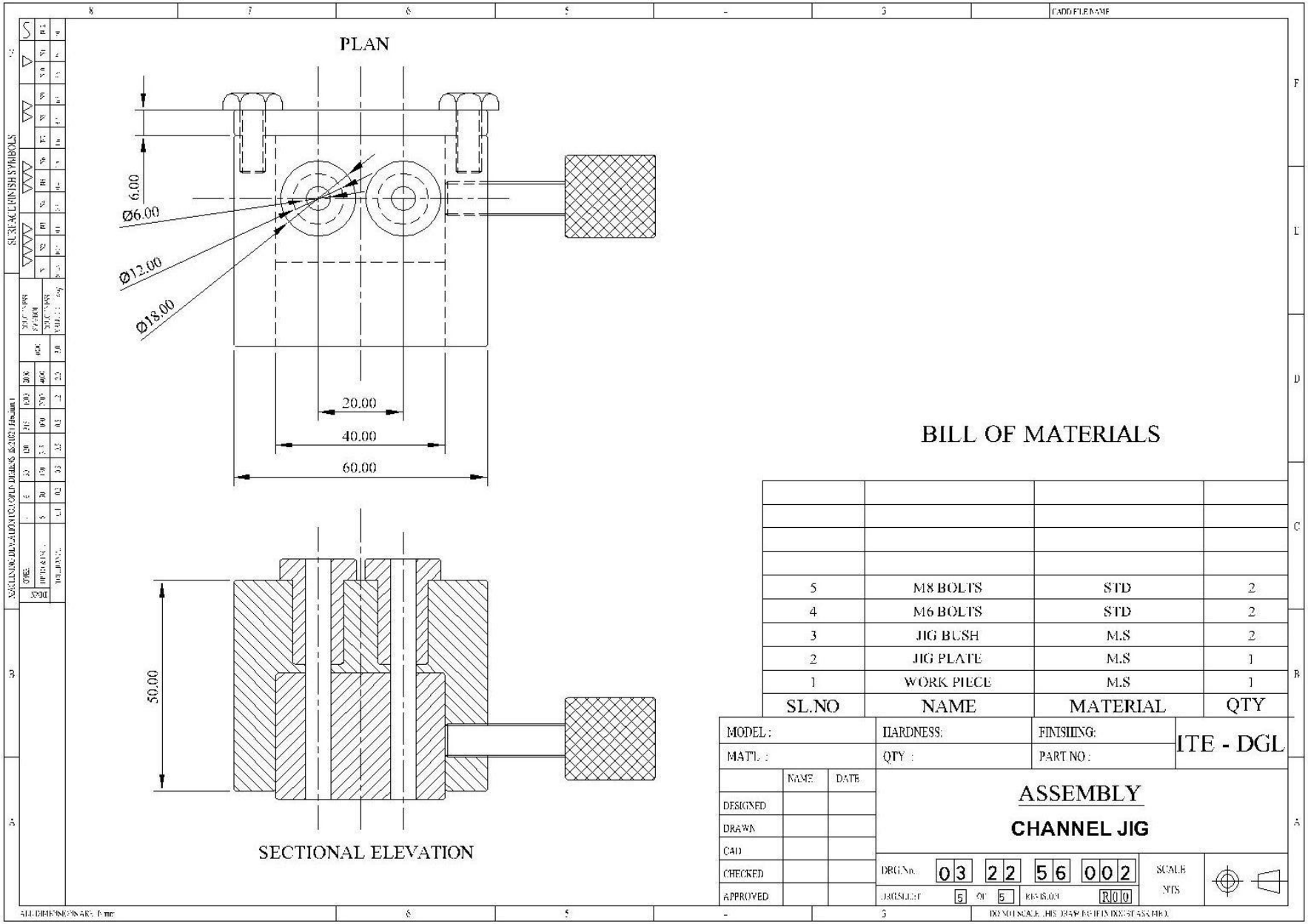
Exercise – II Channel Jig




JIG PLATE
CHANNEL JIG
ITE - DGL
FINISHING: 60x50x50
PART NO : 2
HARDNESS:
QTY : 1 no
MODEL :
MATL : M.S
DRG.No. 03 22 56 002
SCALE NTS
50.00
60.00
Ø6.00X2 HOLES
20.00
40.00
50.00
13.00
M8 TAPPED HOLE
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


30.00
15.00
Ø6.00X 2 HOLES
20.00
40.00
30.00
30.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 40x30x30
PART NO : 1
ITE - DGL
COMPONENT
CHANNEL JIG
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
NAME
DATE
DRG.No. 03 22 56 002
SCALE: NTS


M6X2 HOLES TAPPED
50.00
51.00
60.00
6.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 60x50x10
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : ---
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
SUPPORTING PLATE
CHANNEL JIG
DRG.No. 03 22 56 002
SCALE: NTS
DRG SHEET 4 OF 5
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME/D.



BILL OF MATERIALS

SL.NO	NAME	MATERIAL	QTY
5	M8 BOLTS	STD	2
4	M6 BOLTS	STD	2
3	JIG BUSH	M.S	2
2	JIG PLATE	M.S	1
1	WORK PIECE	M.S	1

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL :	QTY :	PART NO :	

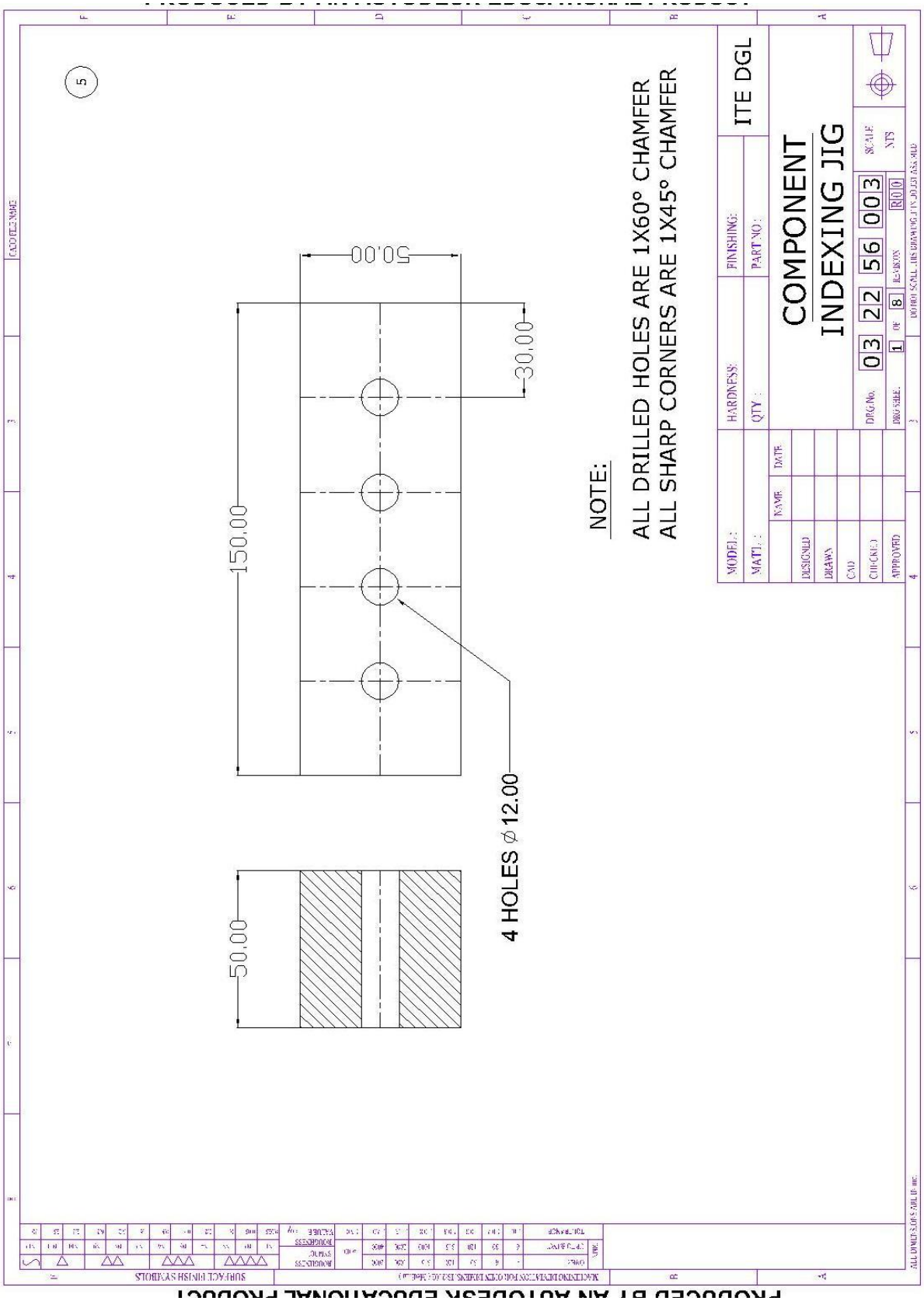
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

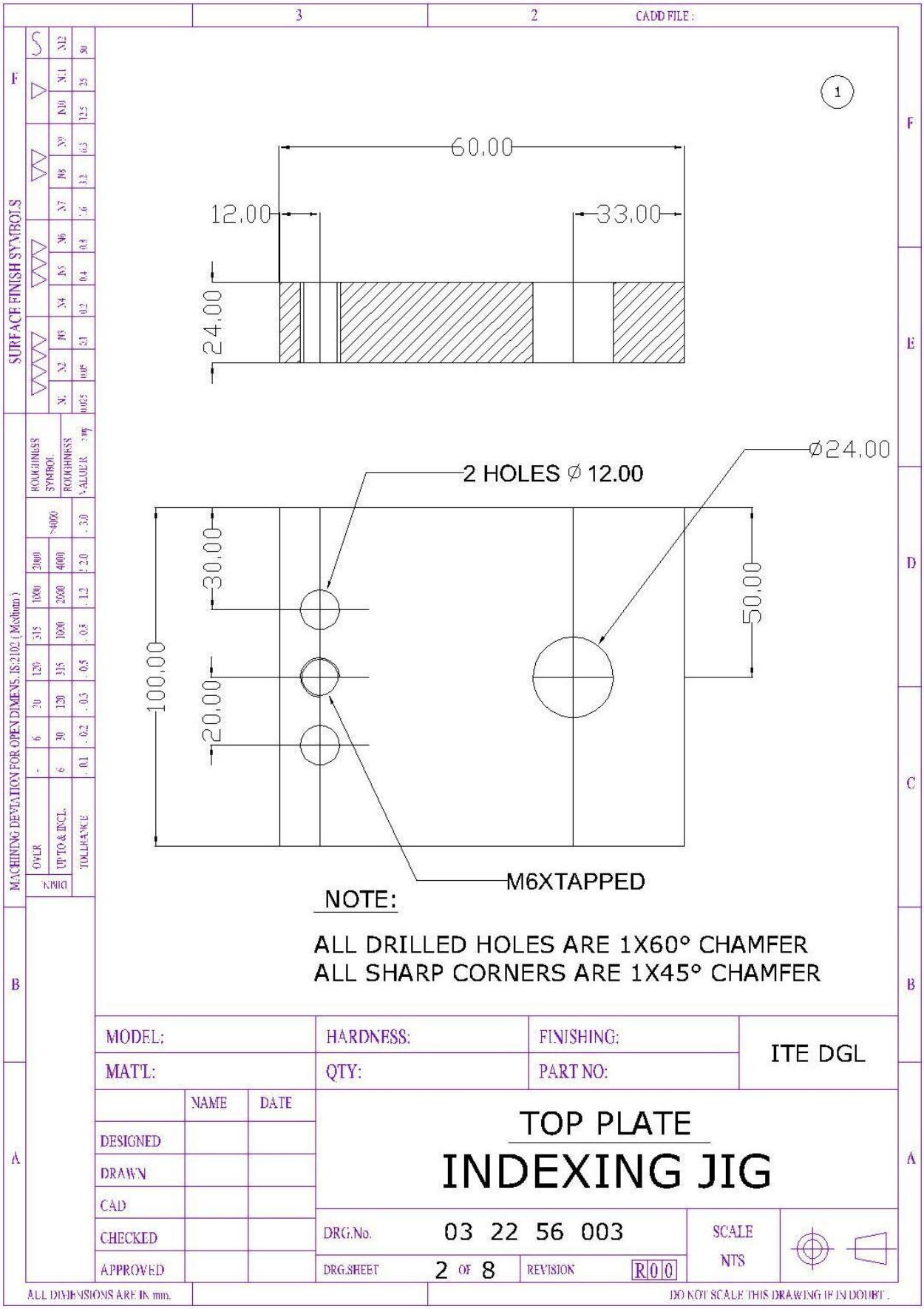
ASSEMBLY

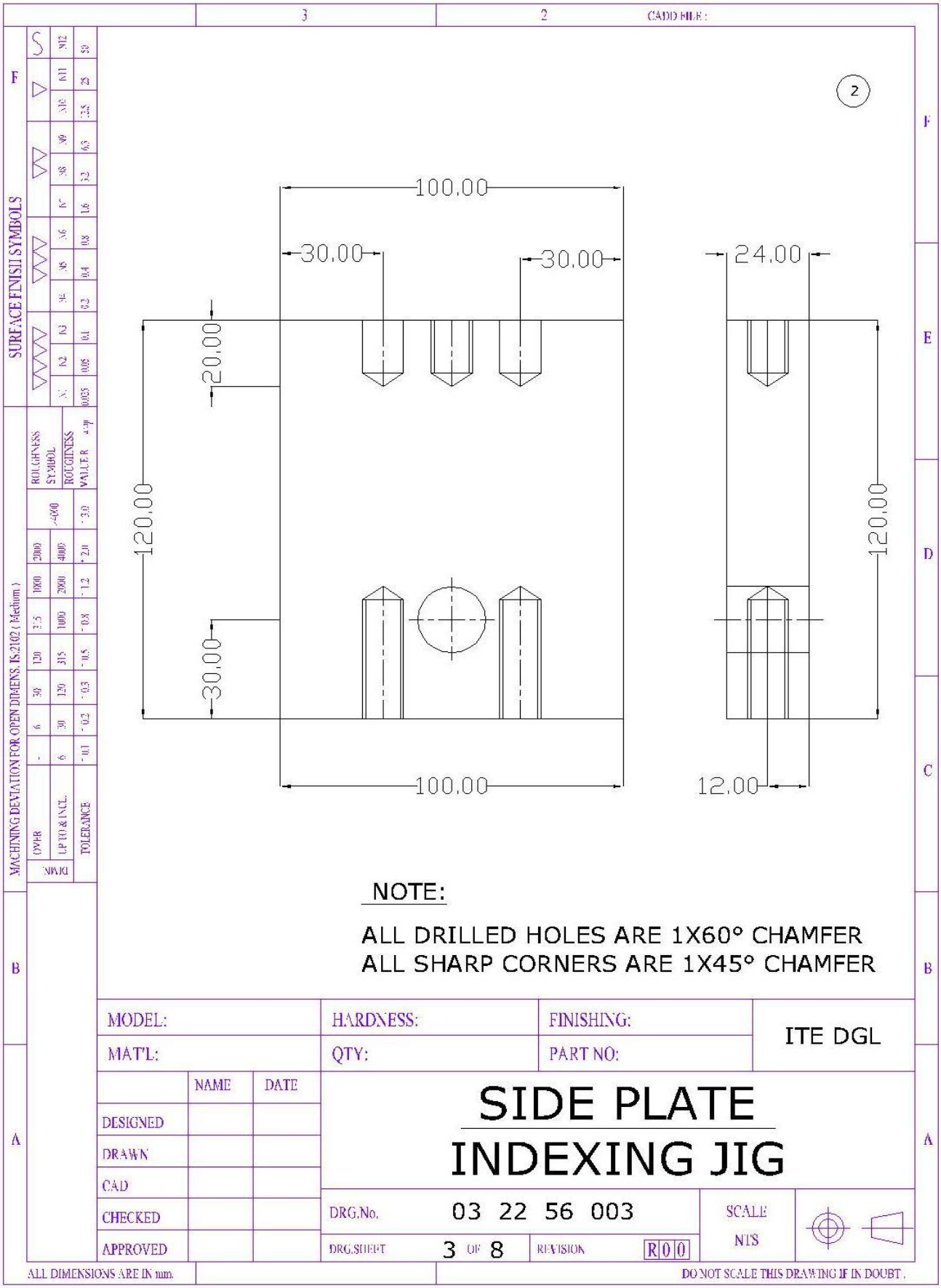
CHANNEL JIG

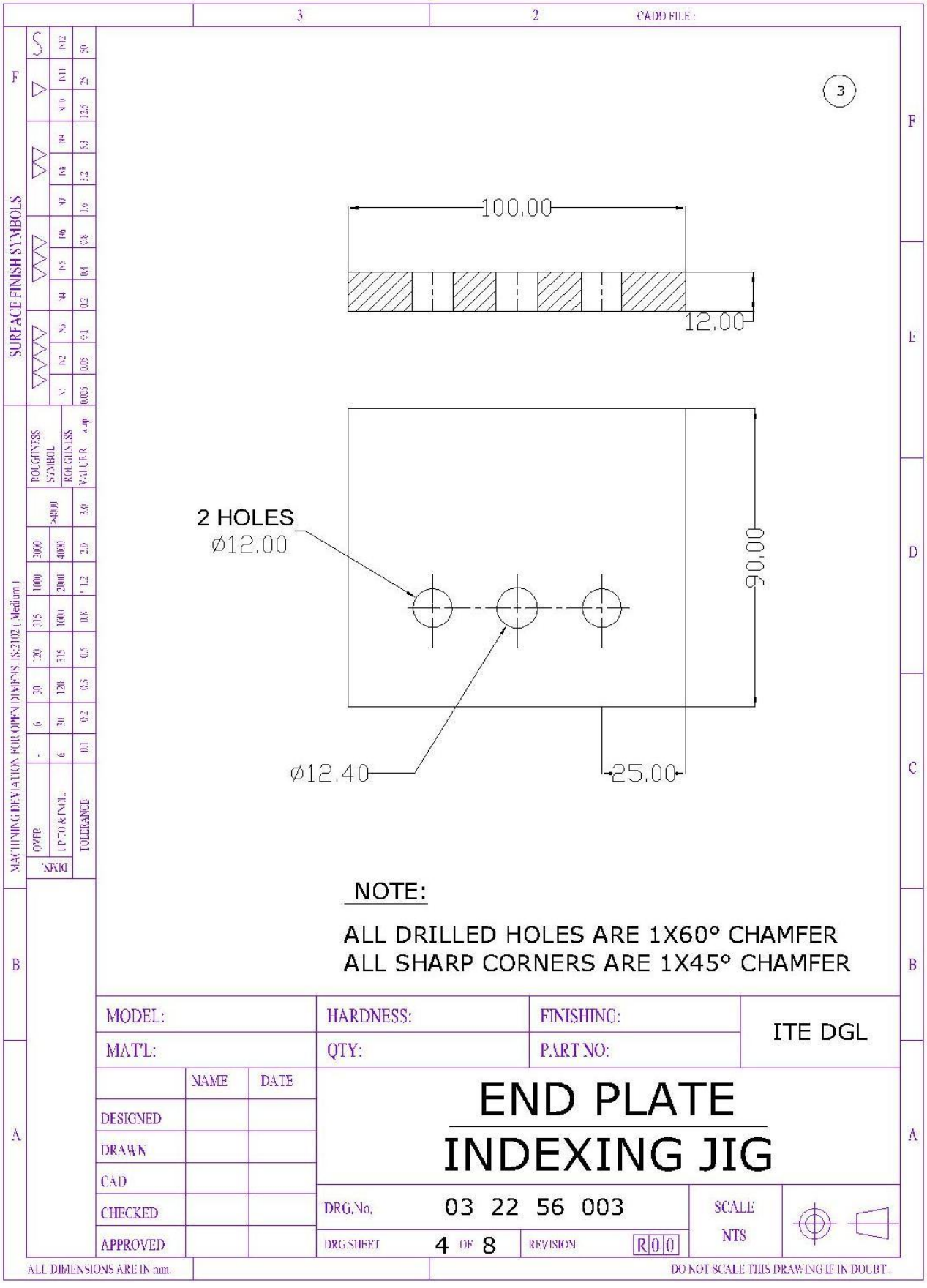
DRG.No. 03 22 56 002 | SCALE NTS | DRG.SHEET 5 OF 5 | REVISION R00

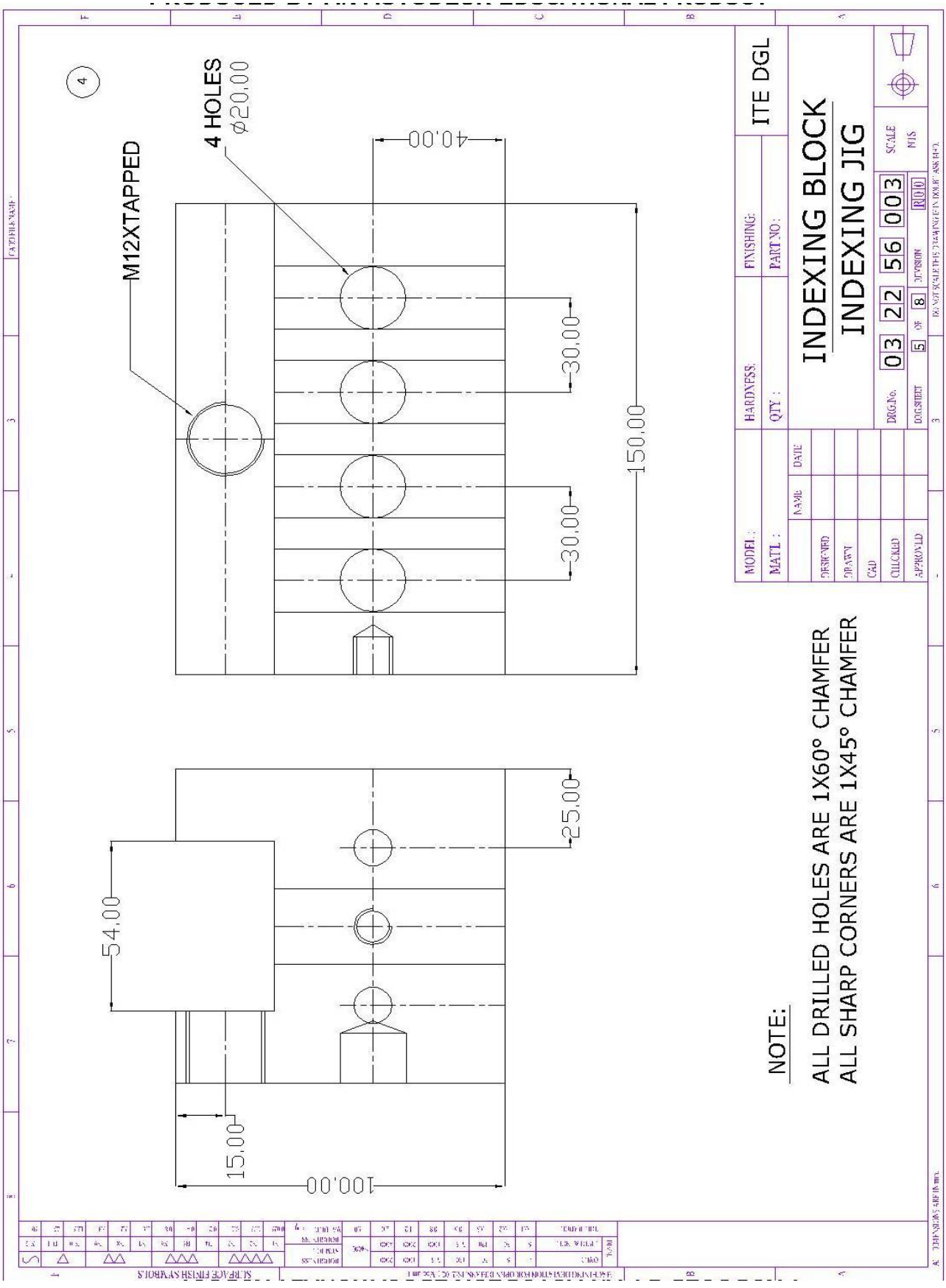
Exercise – III Indexing Jig

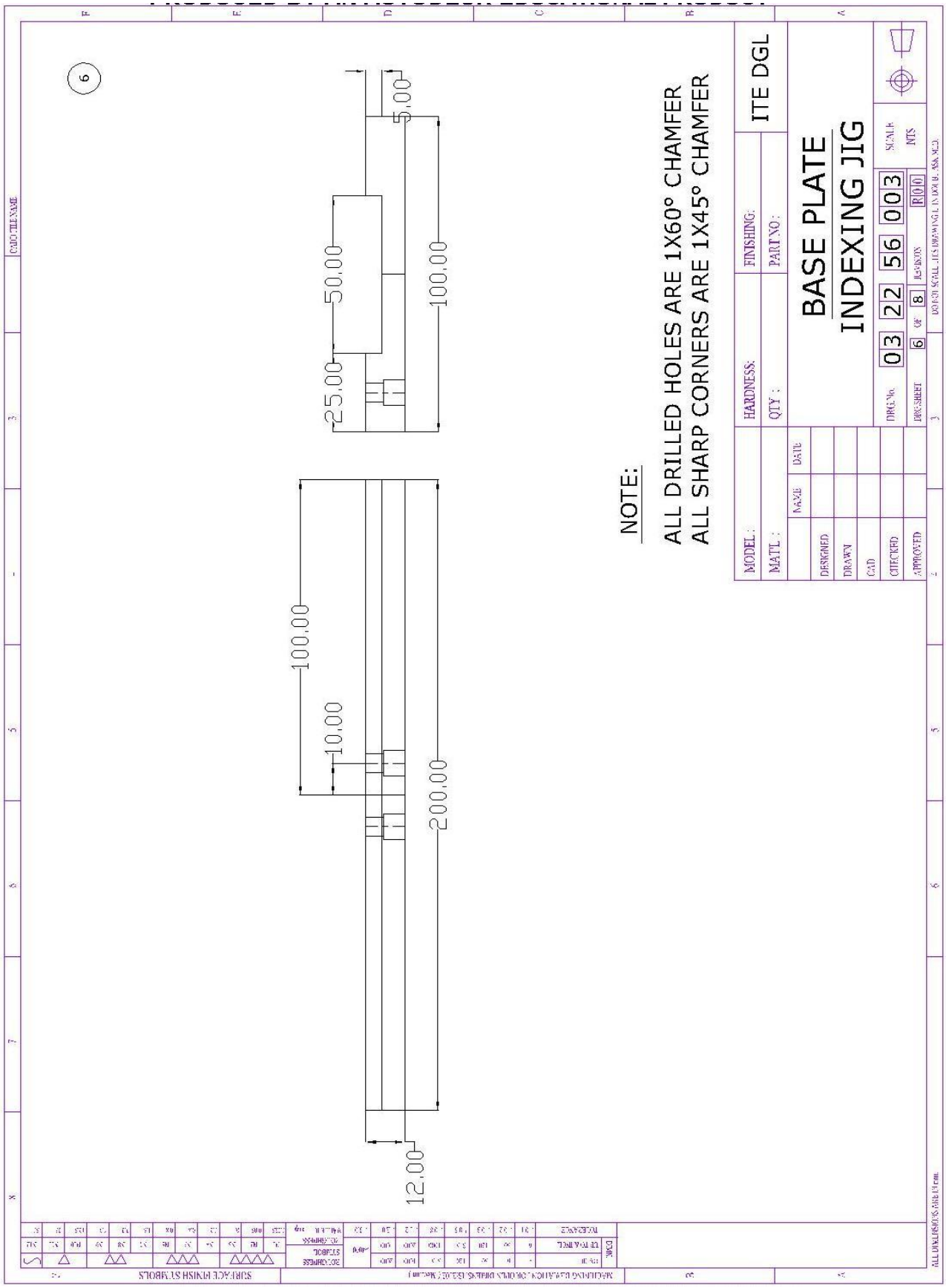


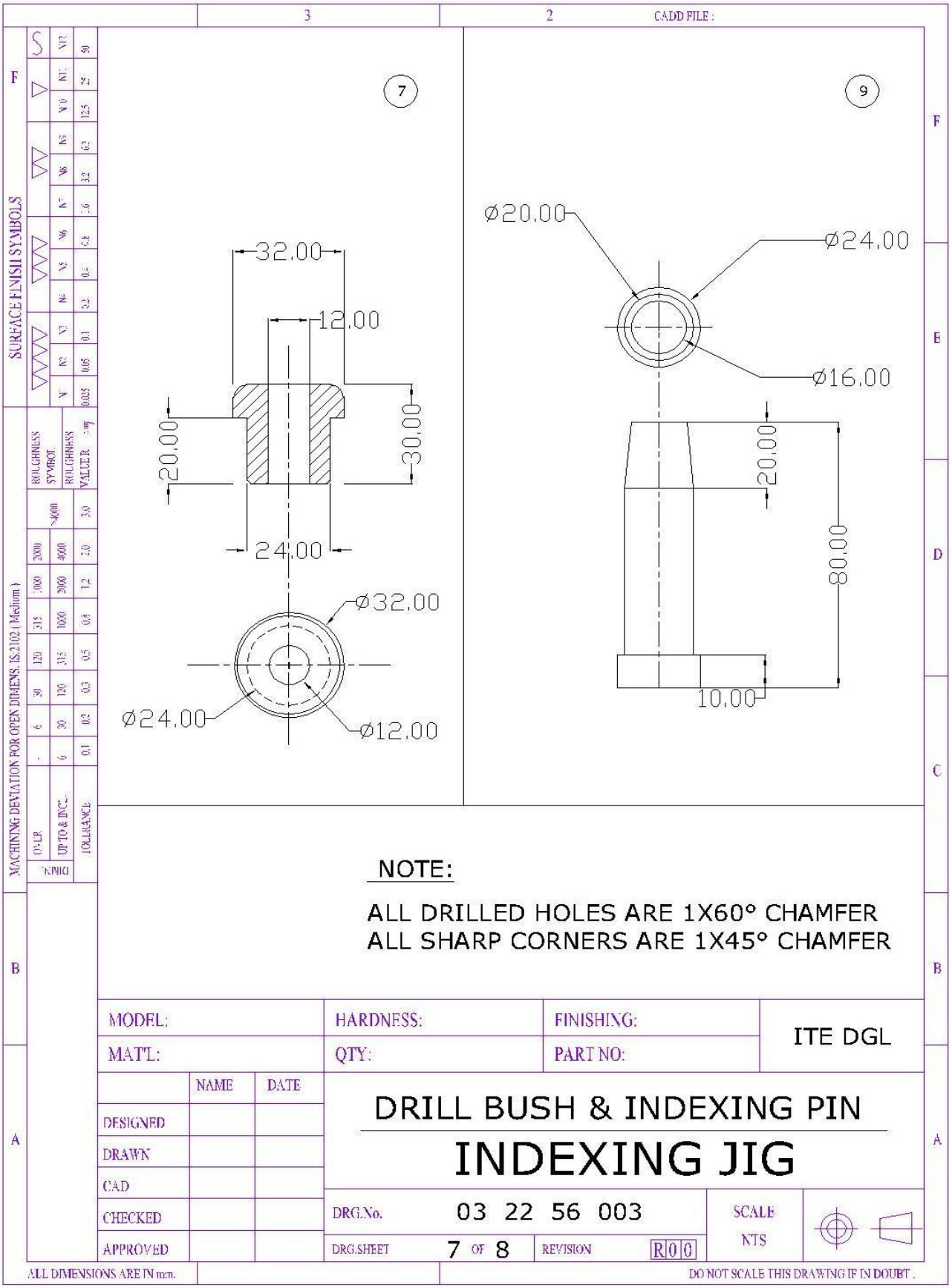

CADD FILE :
SURFACE FINISH SYMBOLS
N12 50
N11 25
N10 12.5
N9 6.3
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a µm
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
OVER
UP TO & INCL.
TOLERANCE
60.00
12.00
33.00
24.00
2 HOLES ∅ 12.00
∅24.00
30.00
20.00
100.00
50.00
M6XTAPPED
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP PLATE
INDEXING JIG
DRG.No. 03 22 56 003
DRG.SHEET 2 OF 8
REVISION R 0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

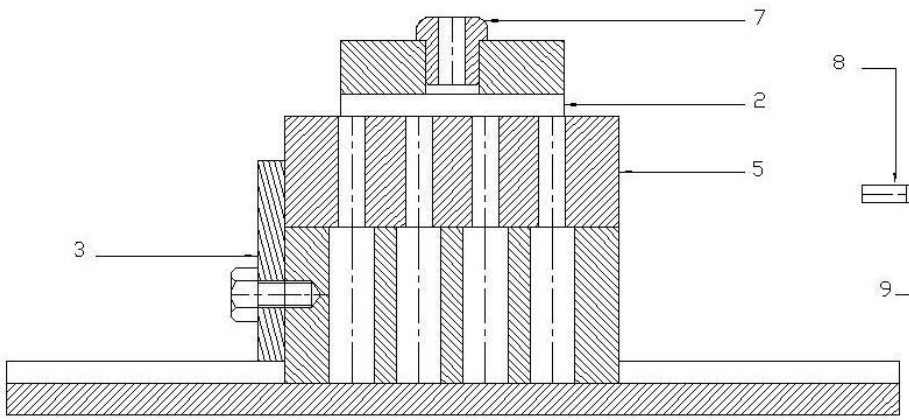

3
2
CADD FILE :
2
100.00
30.00
30.00
20.00
120.00
30.00
100.00
24.00
120.00
12.00
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
SIDE PLATE
INDEXING JIG
DRG.No. 03 22 56 003
DRG.SHEET 3 OF 8
REVISION R0 0
SCALE N!S
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
TOLERANCE
OVER
UP TO & INCL.
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a in µ

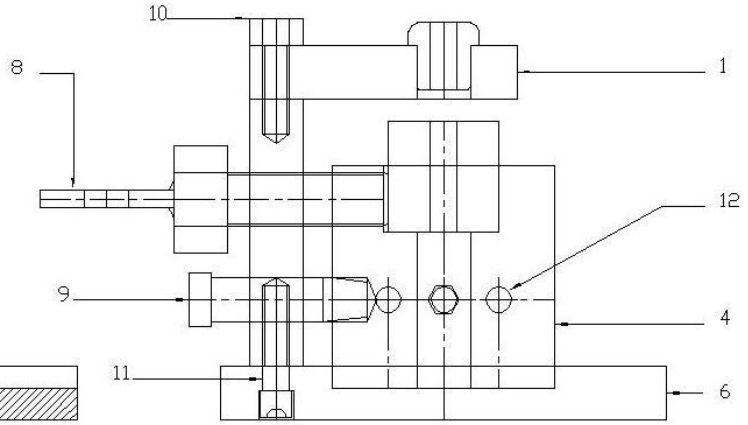

CADD FILE :
3
100.00
12.00
2 HOLES
Ø12.00
90.00
Ø12.40
25.00
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE DGL
MATL:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
END PLATE
INDEXING JIG
DRG.No. 03 22 56 003
DRG.SHEET 4 OF 8
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)


4 HOLES
Ø20,00
M12XTAPPED
40,00
30,00
30,00
150,00
25,00
54,00
15,00
100,00
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
INDEXING BLOCK
INDEXING JIG
ITE DGL
MODEL :
MATL :
HARDNESS:
QTY :
FINISHING:
PART NO :
DRG.No. 03 22 56 003
SCALE
NTS
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DATE


NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
BASE PLATE
INDEXING JIG
ITE DGL
5.00
50.00
25.00
100.00
100.00
10.00
200.00
12.00


CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUES in µm
TOLERANCE
7
9
32.00
12.00
20.00
30.00
24.00
Ø32.00
Ø24.00
Ø12.00
Ø20.00
Ø24.00
Ø16.00
20.00
80.00
10.00
NOTE:
ALL DRILLED HOLES ARE 1X60° CHAMFER
ALL SHARP CORNERS ARE 1X45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DRILL BUSH & INDEXING PIN
INDEXING JIG
DRG.No. 03 22 56 003
DRG.SHEET 7 OF 8
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .





SL.NO	PART NAME	MATERIAL	QUANTITY
12	ø6 DOWEL	STD	4
11	M6 ALLEN SECREW	STD	2
10	HEXOGONAL BOLT	STD	2
9	INDEXING PIN	MS	1
8	EYE BOLT	STD	1
7	DRILL BUSH	MS	1
6	BASE PLATE	MS	1
5	COMPONENT	MS	1
4	INDEXING BLOCK	MS	1
3	END PLATE	MS	1
2	SIDE PLATE	MS	1
1	TOP PLATE	MS	1

BILL OF MATERIALS

MODEL :		HARDNESS:	FINISHING:
MATL :		QTY :	PART NO :

ITE DGL

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY VIEW
INDEXING JIG

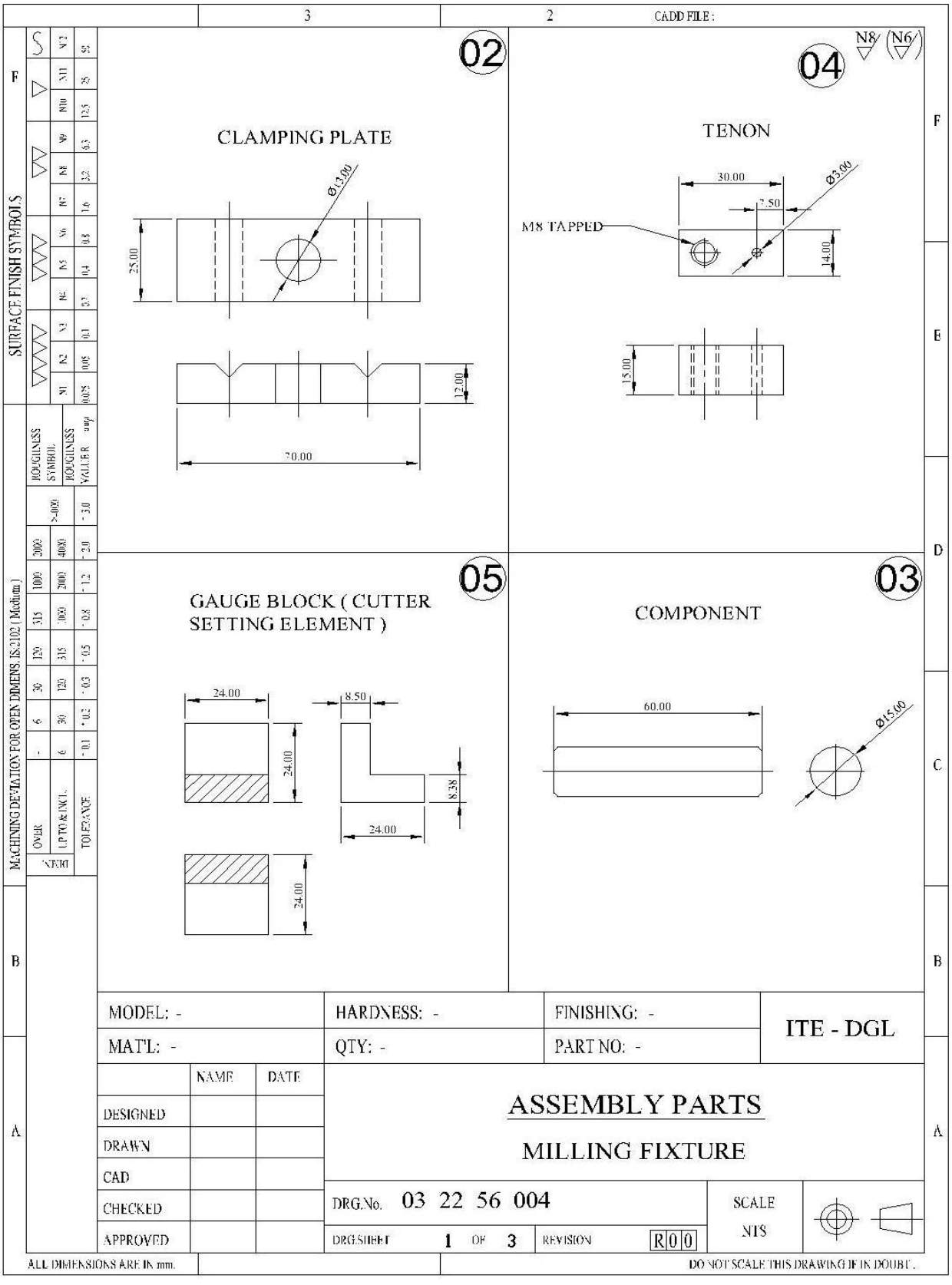
DRG.No. 03 22 56 003 | SCALE NTS

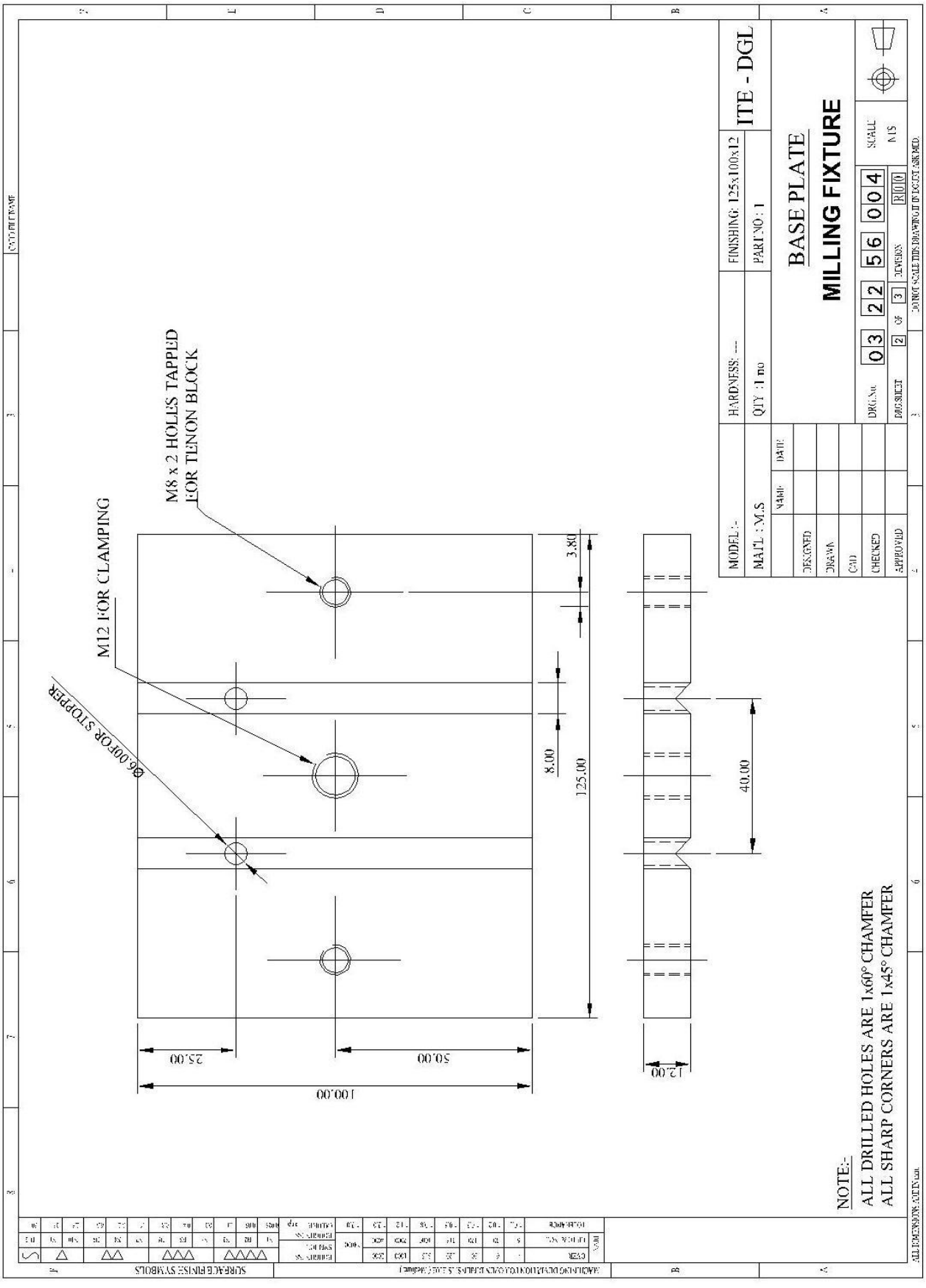
DRG SHEET 8 OF 8 | REVISION R00

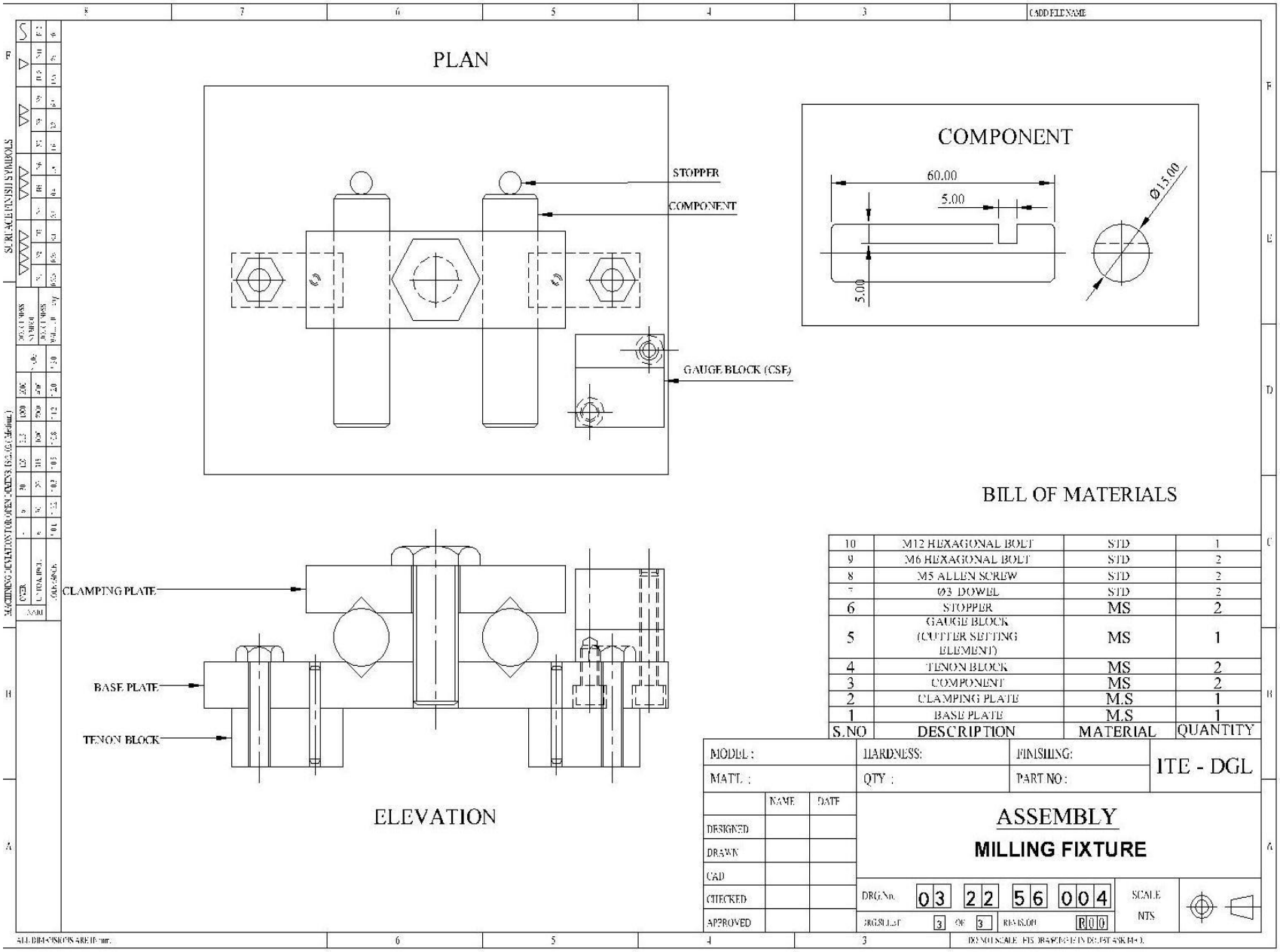
ALL DIMENSIONS ARE IN mm.

DO NOT SCALE THIS DRAWING IF A DOUBT ASK ME!!

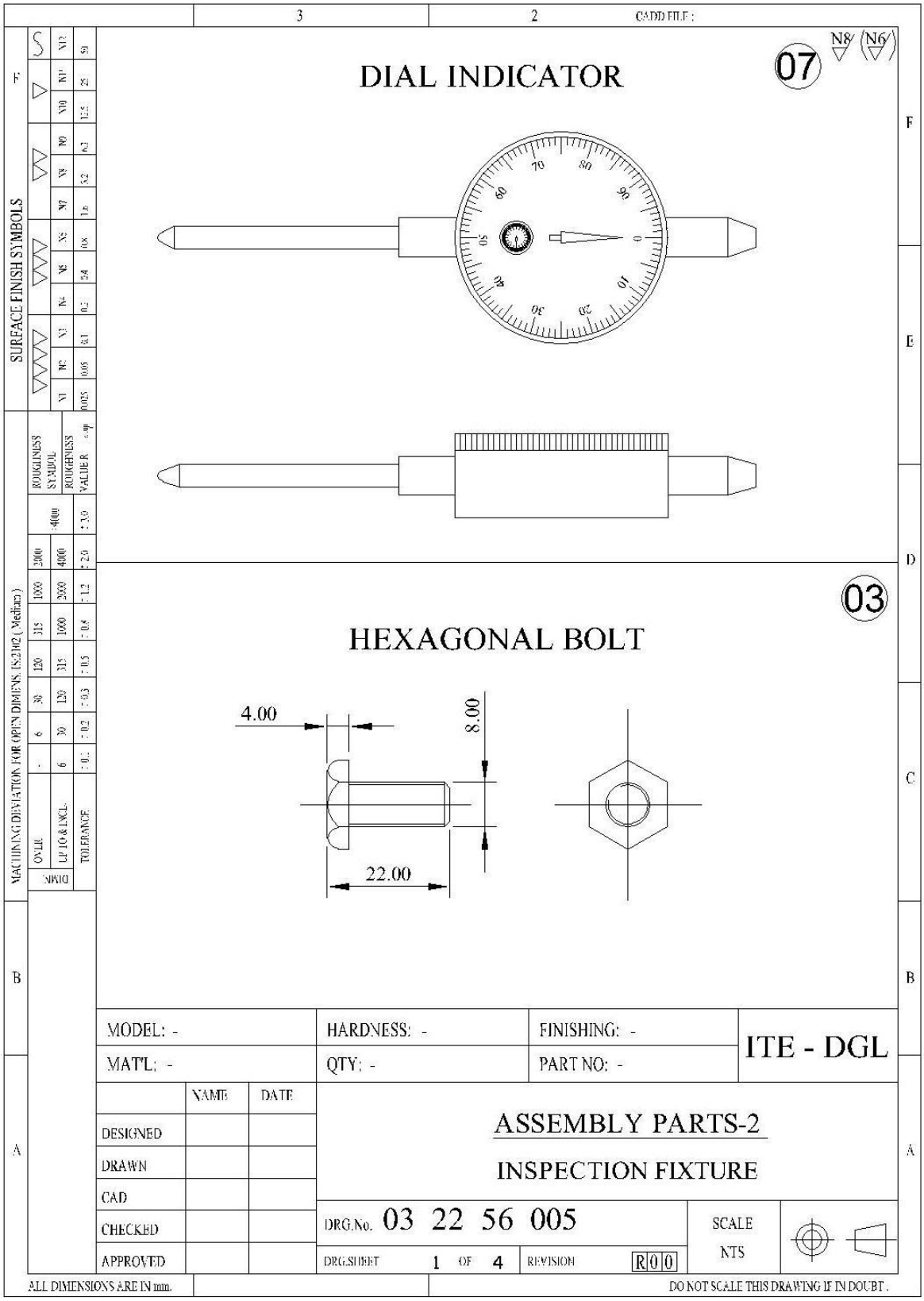
Exercise – IV Milling Fixture

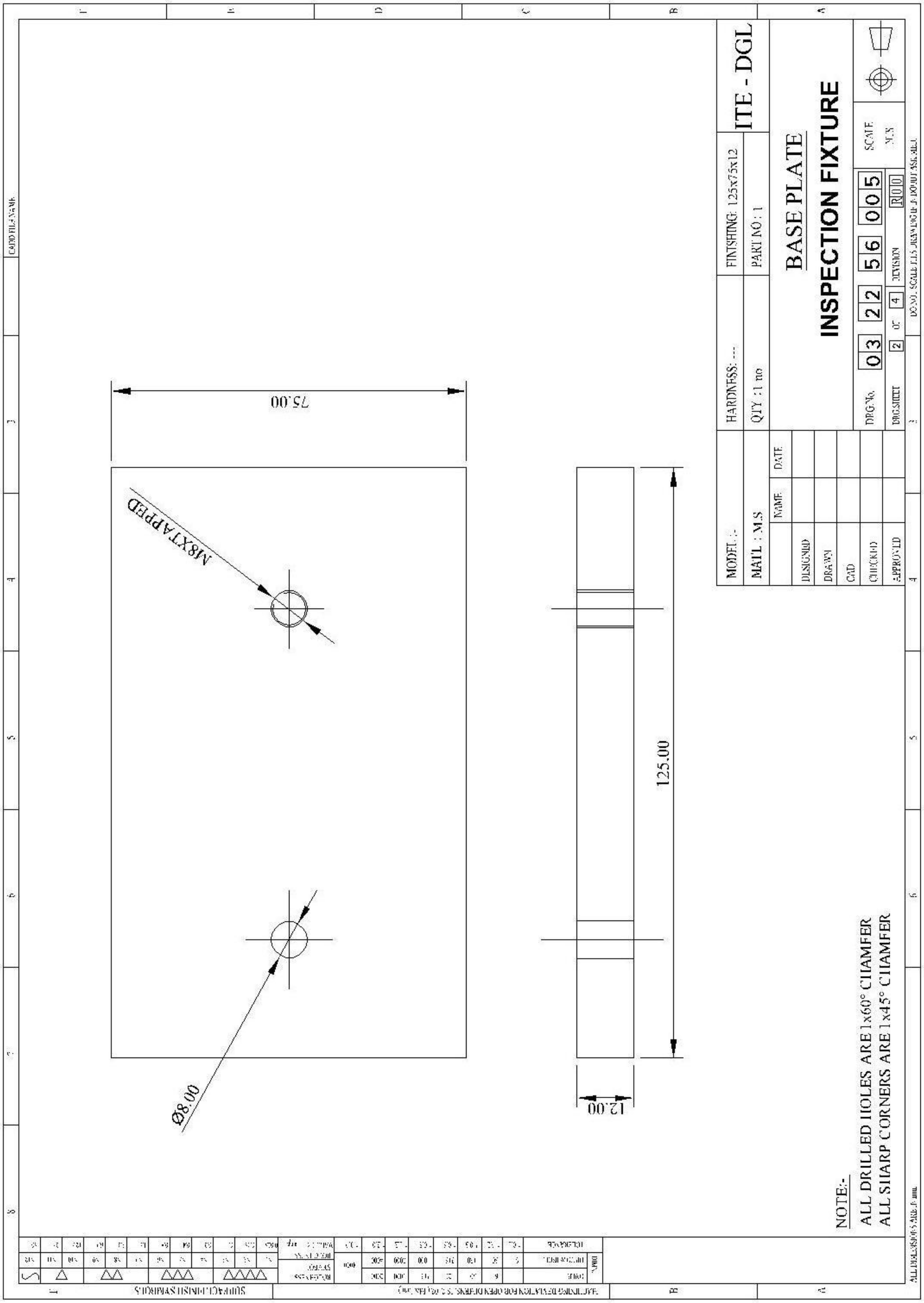


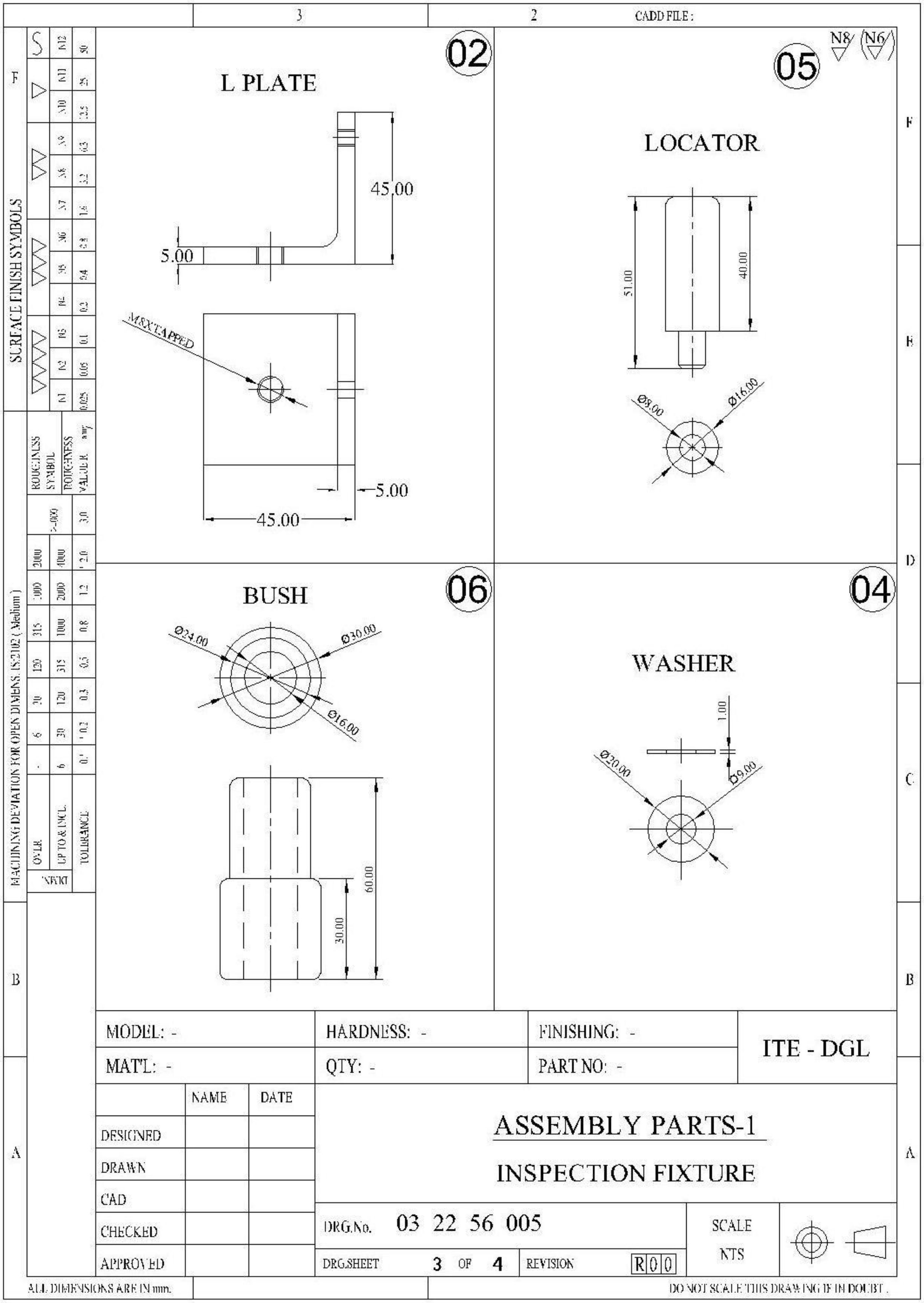

M8 x 2 HOLES TAPPED
FOR TENON BLOCK
M12 FOR CLAMPING
Ø6.00FOR STOPPER
3.80
8.00
125.00
40.00
25.00
50.00
100.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
MATL : M.S
HARDNESS: ---
QTY : 1 no
FINISHING: 125x100x12
PART NO : 1
ITE - DGL
BASE PLATE
MILLING FIXTURE
DESIGNED
DRAWN
CHECKED
APPROVED
DRG.No 03 22 56 004
SCALE: NIS
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME

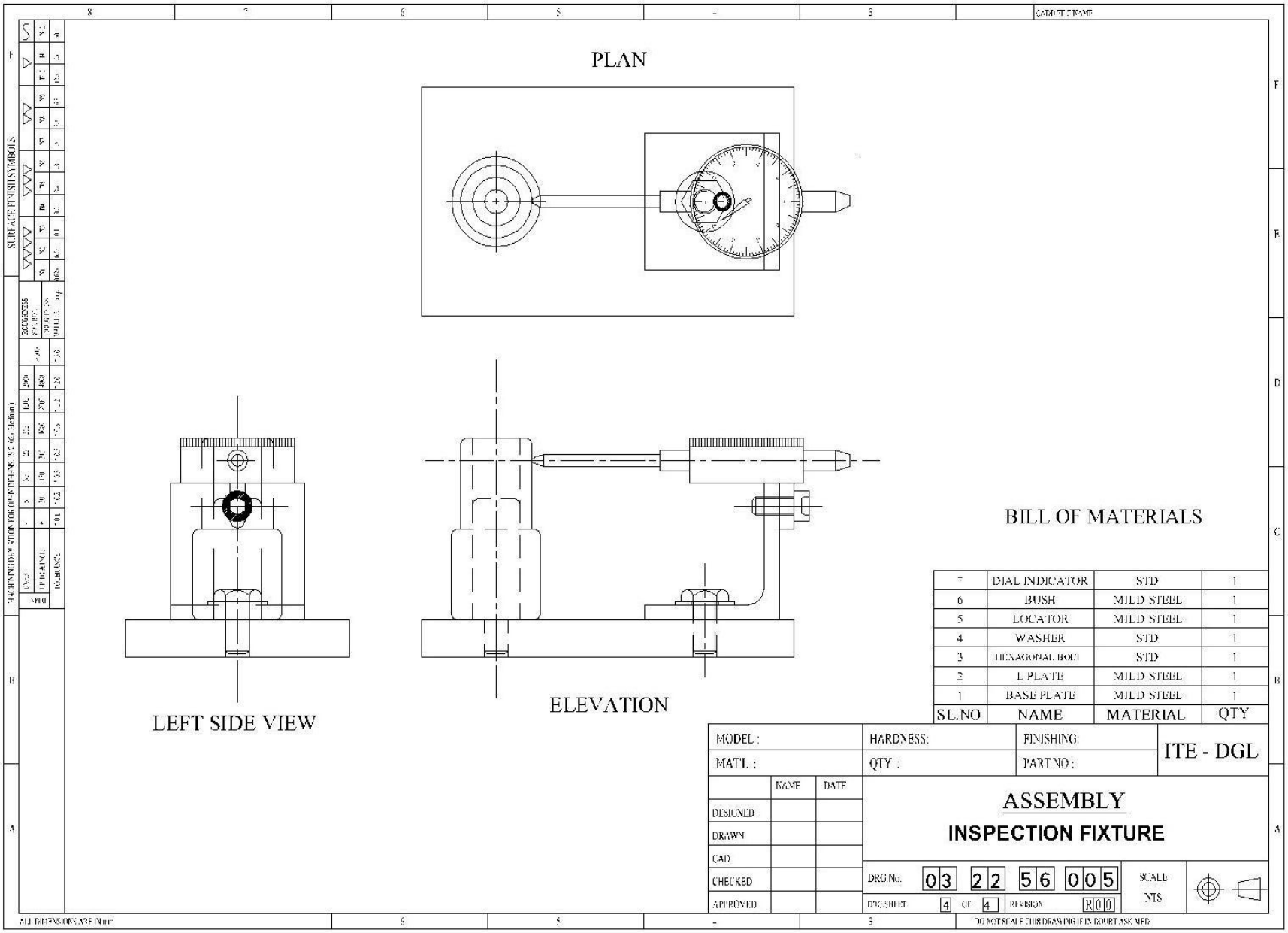

PLAN
STOPPER
COMPONENT
GAUGE BLOCK (CSE)
COMPONENT
60.00
5.00
Ø15.00
5.00
CLAMPING PLATE
BASE PLATE
TENON BLOCK
ELEVATION
BILL OF MATERIALS
10 M12 HEXAGONAL BOLT STD 1
9 M6 HEXAGONAL BOLT STD 2
8 M5 ALLEN SCREW STD 2
7 Ø3 DOWEL STD 2
6 STOPPER MS 2
5 GAUGE BLOCK (CUTTER SETTING ELEMENT) MS 1
4 TENON BLOCK MS 2
3 COMPONENT MS 2
2 CLAMPING PLATE M.S 1
1 BASE PLATE M.S 1
S.NO DESCRIPTION MATERIAL QUANTITY
MODEL :
HARDNESS:
FINISHING:
ITE - DGL
MATL :
QTY :
PART NO :
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY
MILLING FIXTURE
DRG No. 03 22 56 004
SCALE NTS
DRG SHEET 3 OF 3
REVISION R00

Exercise – V Inspection Fixture




ITE - DGL
BASE PLATE
INSPECTION FIXTURE
FINISHING: 125x75x12
PART NO: 1
HARDNESS: ---
QTY: 1 no
MODEL :-
MAT'L : M.S
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DRG No.
03 22 56 005
SCALE
N.S
75.00
125.00
12.00
Ø8.00
M8XTAPPED
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


L PLATE
02
45.00
5.00
M8X TAPPED
5.00
45.00
LOCATOR
05
N8 (N6)
51.00
40.00
Ø8.00
Ø16.00
BUSH
06
Ø24.00
Ø30.00
Ø16.00
60.00
30.00
WASHER
04
1.00
Ø20.00
Ø9.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
CADD FILE :
MODEL: -
HARDNESS: -
FINISHING: -
ITE - DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
INSPECTION FIXTURE
DRG.No. 03 22 56 005
DRG.SHEET 3 OF 4
REVISION R00
SCALE
NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


PLAN
LEFT SIDE VIEW
ELEVATION
BILL OF MATERIALS
7 DIAL INDICATOR STD 1
6 BUSH MILD STEEL 1
5 LOCATOR MILD STEEL 1
4 WASHER STD 1
3 HEXAGONAL BOLT STD 1
2 L PLATE MILD STEEL 1
1 BASE PLATE MILD STEEL 1
SL.NO NAME MATERIAL QTY
MODEL :
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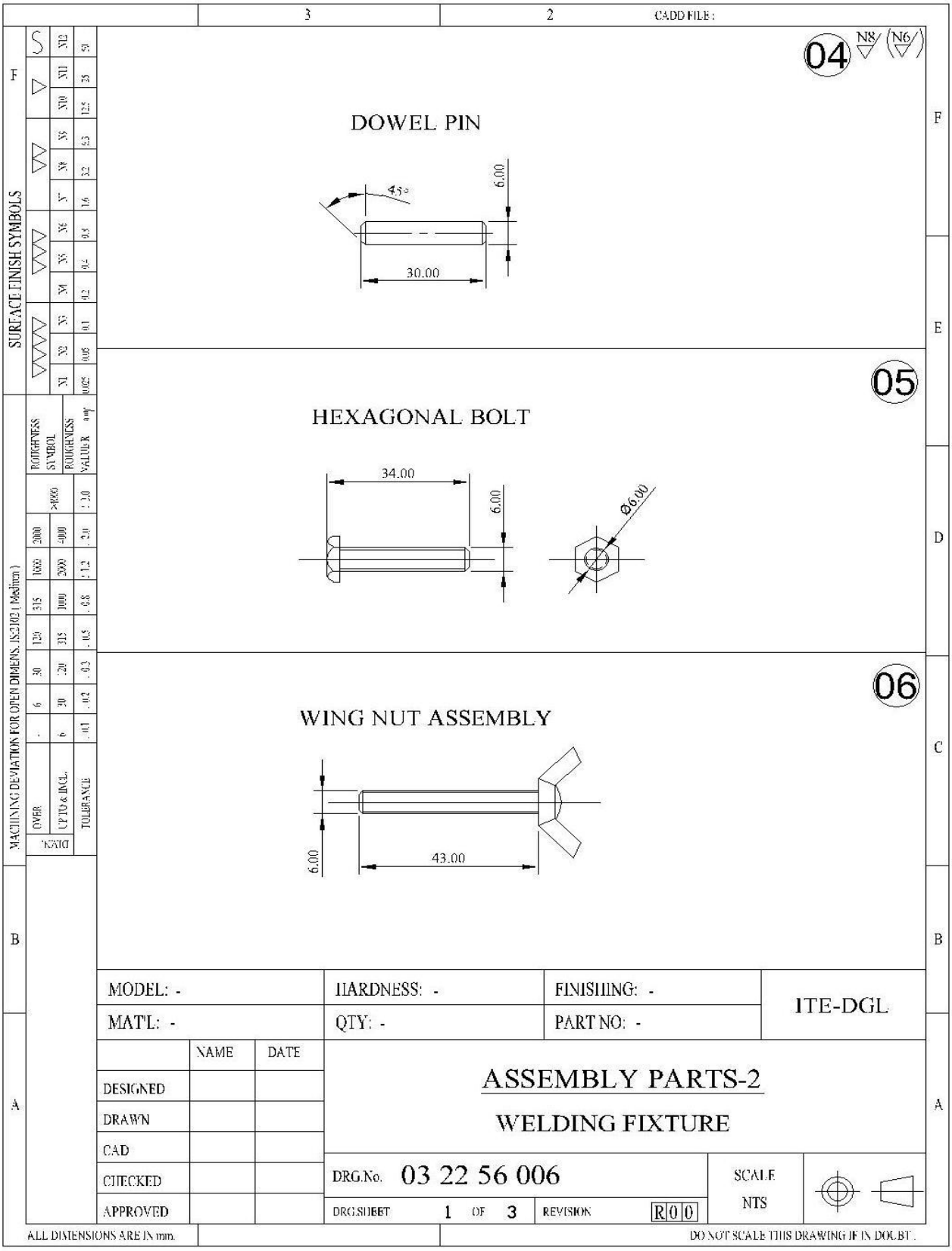

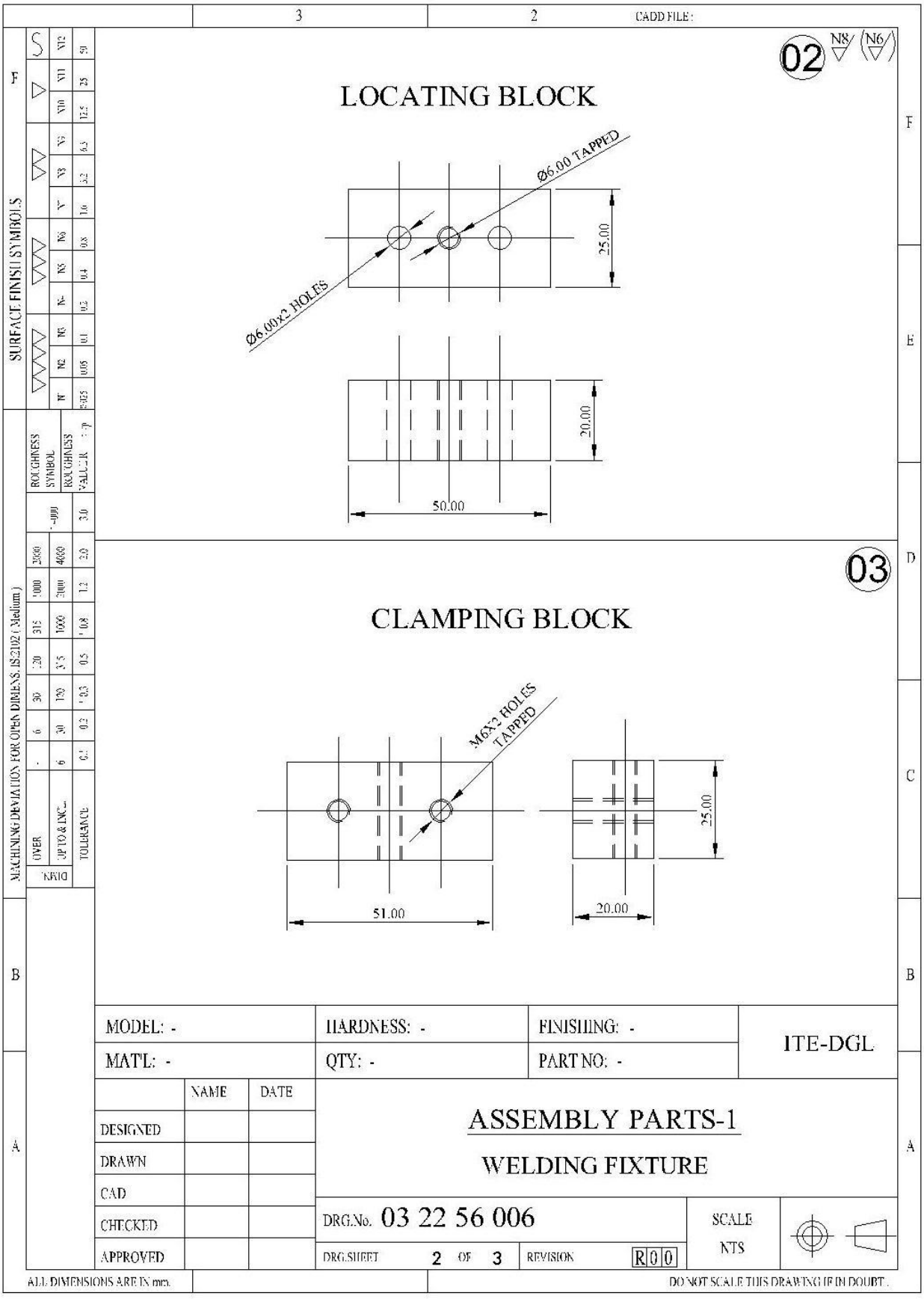
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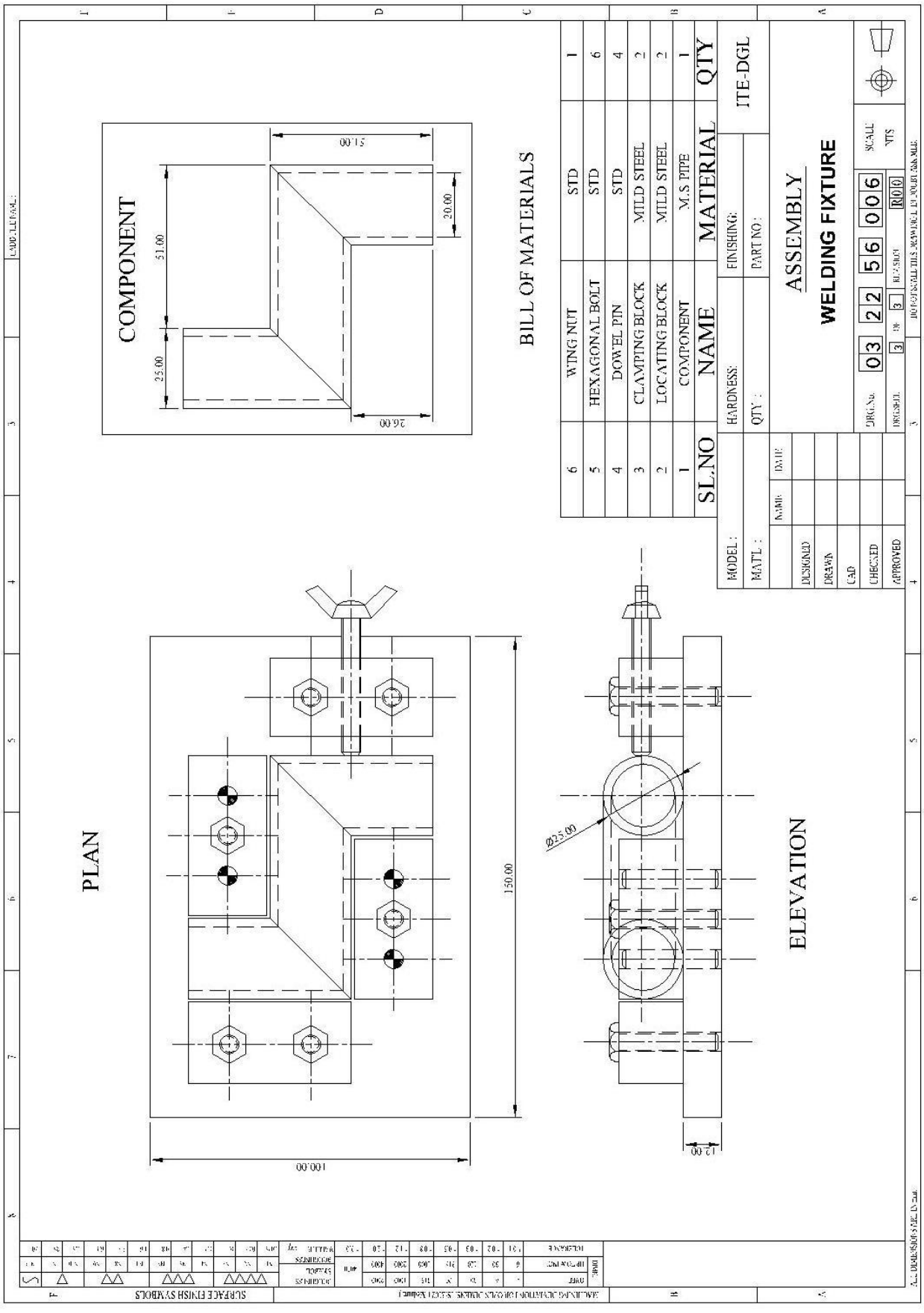
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DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

30002- LIFE AND EMPLOYABILITY SKILL PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING – SYLLABUS – M Scheme
(Being implemented from the Academic Year 2016-2017 onwards)

Course Name : **All Branches of Diploma in Engineering and Technology and Special Programmes**
Subject Code : **30002**
Semester : **V**
Subject Title : **LIFE AND EMPLOYABILITY SKILLS PRACTICAL**

Teaching and Scheme of Examination: **No. of Weeks per Semester**: **15 Weeks**

Subject	Instruction		Examination			
			Marks			
	Hours/ Week	Hours/ Semester	Internal assessment	Board Examination	Total	Duration
Life and Employability Skills	4 Hours	60 Hours	25	75	100	3 Hours

Topics and Allocation of Hours:

Sl. No.	Section	No. of Hours
1	**Part – A** Communication	**30**
2	**Part – B** Entrepreneurship, Project Preparation, Productivity, Occupational Safety, Health, Hazard, Quality Tools& Labour Welfare	**20**
3	**Part – C** Environment, Global Warming, Pollution	**10**
TOTAL		**60**

RATIONALE

Against the backdrop of the needs of the Industries, as wells as based on fulfilling the expectations of the Industries, the Diploma Level students have to be trained directly and indirectly in toning up their competency levels. Proficiency in Communication only, equips them with confidence and capacity to cope with the employment. Hence, there is a necessity to focus on these in the curriculum. At the end of the Course, the student is better equipped to express himself in oral and written communication effectively.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1. **Emphasize and Enhance Speaking Skills**

2. **Increase Ability to Express Views & Opinions**

3. **Develop and Enhance Employability Skills**

4. **Induce Entrepreneurship and Plan for the Future**

5. **Expose & Induce Life Skills for Effective Managerial Ability**

LIFE AND EMPLOYABILITY SKILLS PRACTICAL SYLLABUS

Unit	Topics	Activity	Hours
I	**Communication, Listening, Training, Facing Interviews, Behavioural Skills**	-- instant sentence making – say expressions/phrases-- self- introduction/another higher official in company – describe/explain product – frame questions based on patterns – make sentences based on patterns	**30**
II	**Entrepreneurship, Project Preparation, Marketing Analysis, Support & Procurement**	-- prepare an outline of a project to obtain loan from bank in becoming an entrepreneur – prepare a resume	**10**
III	**Productivity – comparison with developed countries, Quality Tools, Circles, Consciousness, Management, House Keeping**	-- search in the website -- prepare a presentation – discuss & interact	**05**
IV	**Occupational Safety, Health Hazard, Accident & Safety, First-Aid,Labour Welfare Legislation, Welfare Acts**	-- search in the website -- prepare a presentation – discuss & interact	**05**

V	**Environment, Global Warming, Pollution**	-- taking down notes / hints – answering questions -- fill in blanks the exact words heard	**10**

LEARNING STRUCTURE **100 Marks**

-- Focus more on Speaking & Listening Skills
-- Attention less on Reading & Writing Skills
-- Apply the skills in fulfilling the Objectives on Focused Topics

a) Listening **25 Marks**

1. Deductive Reasoning Skills (taking down notes/hints) **10**
2. Cognitive Skills (answering questions) **10**
3. Retention Skills (filling in blanks with exact words heard) **05**

b) Speaking Extempore/ Prepared **30 Marks**

1. Personality/Psychological Skills (instant sentence making) **05**
2. Pleasing & Amiable Skills (say in phrases/expressions) **05**
3. Assertive Skills (introducing oneself/others) **05**
4. Expressive Skills (describe/explain things) **05**
5. Fluency/Compatibility Skills (dialogue) **05**
6. Leadership/Team Spirit Skills (group discussion) **05**

c) Writing & Reading **20 Marks**

1. Creative & Reasoning Skills (frame questions on patterns) **05**
2. Creative & Composing Skills (make sentences on patterns) **05**
3. Attitude & Aim Skills (prepare resume) **05**
4. Entrepreneurship Skills (prepare outline of a project) **05**

d) Continuous Assessment (Internal Marks) **25 Marks**

(search,read, write down, speak, listen, interact & discuss)

1. Cognitive Skills (Google search on focused topics)
2. Presentation Skills& Interactive Skills (after listening, discuss)

Note down and present in the Record Note on any 5 topics **10 Marks**
Other activities recorded in the Record note **10 Marks**
Attendance **05 Marks**

INTERNAL MARKS **25 MARKS**

EXTERNAL MARKS AT END EXAMINATION **75 MARKS**

MODEL QUESTION

Time: 3 Hours **Maximum Marks: 75**

A. LISTENING 25 Marks

1. Listen to the content and take down notes/hints 10
2. Listen to the content and answer the following questions. 10
3. Listen to the content and fill in the blanks the exact words heard. 05

B. SPEAKING 30 Marks

1. Say in a sentence instantly on hearing the word(5 words, one after another). 05
2. Say any five expressions commonly used in communication. 05
3. Imagine, a consultant has come to your department.
   Introduce him to your subordinates. 05
4. Explain/describe the product you are about to launch in the market. 05
5. Speak with your immediate boss about the progress you have made. 05
6. Discuss within the group on the topic of focus in the syllabus. 05

C. WRITING & READING 20 Marks

1. Frame new questions from the pattern given by changing sets of words with your own. 05

a.	When	do	you	return?
b.	How	is	his performance?	
c.	Where	has	the manager	gone?
d.	What	is	the progress	today?
e.	Why	are	the machines	not functioning?

2. Make sentences from the pattern given by changing sets of words with your own. 05

a.	The workers	are	on strike		
b.	The labourers	are paid	well	in this factory	
c.	There	is	a rest room	for the workers	
d.	These	are	the new products	launched	by our company
e.	Almost everyone	come	to the company	on motorbikes	

3. Prepare a resume for the post of Department Manager. 05

4. Prepare an outline of a project to obtain a loan. (Provide headings and subheadings) 05

I. Guidelines for setting the question paper:

A. LISTENING :

ONLY TOPICS related to
POLLUTION /
ENVIRONMENT /
GLOBAL WARMING are to be taken.
These topics are common for all the three types of evaluation.

B. SPEAKING :

1. WORDS of common usage
2. Fragments – expression of politeness, courtesy, cordiality
3. Introduce yourself as an engineer with designation or
   Introduce the official visiting your company/department

4. Describe/Explain the product/machine/department
5. Dialogue must be with someone in the place of work.
6. Group of six/eight
   Discuss the focused topic prescribed in syllabus

C. WRITING & READING:

1. Provide five different structures.
   Students are to substitute at least one with some other word/words
2. Provide five different structures.
   Students are to substitute at least one with some other word/words
3. Provide some post related to industries.
4. Outline of the project (skeleton/structure)
   Only the various headings and subheadings
   Content is not needed

II. Guidelines for recording the material on the Focused Topics in the Record note.

Write in the record note, **on any five topics**, from the list of topics given below. **10 Marks**
(5 topics x 10 marks = 50 marks. Thus, the **Average of 5 topics is 10 Marks)**

1. Productivity in Industries – Comparison with developed countries
2. Quality Tools, Quality Circles and Quality Consciousness

3. Effective Management
4. House Keeping in Industries
5. Occupational Safety and Hazard
6. Occupational Accident and First Aid
7. Labour Welfare Legislations
8. Labour Welfare Acts and Rights
9. Entrepreneurship
10. Marketing Analysis, Support and Procurement

LABORATORY REQUIREMENT:

1. An echo-free room
2. Necessary furniture and comfortable chairs
3. A minimum of two Computers with internet access
4.A minimum of two different English dailies
5. A minimum of Three Mikes with and without cords
6. Colour Television (minimum size – 29")
7. DVD/VCD Player with Home Theatre speakers
8. Smart board
9. Projector

Suggested Reading:

1. Production and Operations Management by S.N. Chary, TMH
2. Essentials of Management by Koontz &Weihrich, TMH
3. Modern Production / Operations Management by E.S. Buffa and R.K. Sarin, John Wiley &
Sons
4. Production Systems: Planning, Analysis and Control by J.L.Riggs, 3rd ed., Wiley.
5. Productions and Operations Management by A.Muhlemann, J.Oakland and K.Lockyer, Macmillan
6. Operations Research - An Introduction by H.A.Taha, Prentice Hall of India
7. Operations Research by J.K.Sharma, Macmillan
8. Business Correspondence & Report Writing by R.C. Sharma and K.Mohan, TMH
9. How to prepare for Group Discussion & Interview (With Audio Cassette) by Prasad, TMH
10. Spoken English – A self-learning guide to conversation practice (with Cassette)
11. Introduction to Environmental Engineering by Mackenzie, L. Davis and A. David, Cornwell, McgrawHill, 3rd Ed.
12. Environmental Engineering by Peary, Rowe and Tchobanoglous, McgrawHill
13. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
14. Quality Control and Applications by Housen&Ghose
15. Industrial Engineering Management by O.P. Khanna

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

32061 - INDUSTRIAL ENGINEERING AND MANAGEMENT

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implemented from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING(TOO AND DIE)

Course Code : 1220

Subject Code : 32061

Semester : VI

Subject Title : Industrial Engineering and Management

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
Industrial Engineering and Management	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	6	90	**Internal Assessment**	**Board Examination**	**Total**	3 Hours
			25	75	100	

Topics and Allocation of Hours:

UNIT NO.	TOPIC	HOURS
I	PLANT ENGINEERING AND PLANT SAFETY	17
II	WORK STUDY, METHOD STUDY AND WORK MEASUREMENT	17
III	PRODUCTION PLANNING AND QUALITY CONTROL	17
IV	PRINCIPLES, PERSONNEL MANAGEMENT AND ORGANIZATIOAL BEHAVIOR:	16
V	FINANCIAL AND MATERIAL MANAGEMENT	16
	REVISION AND TEST	7
	TOTAL	**90**

RATIONALE:

In the Indian Economy, Industries and Enterprises always find prominent place. After globalization, the students should be trained not only in manufacturing processes but also in managing activities of industries. The knowledge about plant, safety, work study techniques, personnel management and financial management will definitely mould the students as managers to suit the industries.

OBJECTIVES:

- To study the different types of layout.
- To study the safety aspects and its impacts on an organization.
- To study different work measurement techniques.
- To study production planning and control and its functions.
- To study basic and modern management techniques.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control system.
- To study about organization and it's behavior.

INDUSTRIAL ENGINEERING AND MANAGEMENT

DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPIC	HOURS
I	**PLANT ENGINEERING AND PLANT SAFETY** **Plant Engineering :** Plant – Selection of site of industry – Plant layout – Principles of a good layout – types – process, product and fixed position – techniques to improve layout – Principles of material handling equipment – Plant maintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance. **Plant Safety:** Importance –accident-causes and cost of an accident-accident proneness-prevention of accidents-Industrial disputes-settlement of Industrial disputes-Collective bargaining, conciliation, Mediation, arbitration-Indian Factories Act 1948 and its	17

	provisions related to health, welfare and safety.	
II	**WORK STUDY, METHOD STUDY AND WORK MEASUREMENT** **Work Study:** Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions. **Method Study:** Definition – Objectives – Selection of a job for method study –Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man machine chart, String diagram and flow diagram. **Work Measurement:** Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, Process, Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement-Ratio delay study, Synthesis from standard data, analytical estimating and Pre determined Motion Time System (PMTS).	**17**
III	**PRODUCTION PLANNING AND QUALITY CONTROL** **Production Planning and Control:** Introduction – Major functions of production planning and control – Pre planning – Methods of forecasting – Routing and scheduling – Dispatching and controlling – Concept of Critical Path Method (CPM)-Description only. Production – types-Mass production, batch production and job order production- Characteristics – Economic Batch Quantity (EBQ) – Principles of product and process planning – make or buy decision. **Quality Control:** Definition – Objectives – Types of inspection – First piece, Floor and centralized inspection – Advantages and disadvantages. Quality control – Statistical quality control – Types of measurements – Method of variables – Method of attributes – Uses of X, R, p and c charts – Operating Characteristics curve (O.C curve) – Sampling inspection – single and double sampling plan – Concept of ISO 9001:2008 Quality Management System	**17**

	Registration Certification procedure – Benefits of ISO to the organization.	
IV	**PRINCIPLES, PERSONNEL MANAGEMENT AND ORGANIZATIOAL BEHAVIOR:** **Principles of Management:** Definition of management – Administration - Organization – F.W. Taylor's and Henry Fayol's Principles of Management – Functions of Manager – Directing – Leadership -Styles of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation --Modern management techniques- Just In Time – Total Quality Management (TQM) – Quality circle – Zero defect concept – 5S Concept- Management Information Systems – Strategic management – SWOT Analysis --Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) –Supply Chain Management (SCM) – Activity Based Management (ABM) – Global Perspective – Principles and brief describtion. **Personnel Management:** Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment – Halsey's 50% plan, Rowan's plan and Emerson's efficiency plan – Problems. **Organizational behavior:** Definition – organization--Types of Organization – Line, Staff,Taylor's Pure functional types – Line and staff and committee type –Organizational Approaches, individual behavior—causes—Environmental effect—Behavior and Performance, Perception-organizational implications.	**16**
V	**FINANCIAL AND MATERIAL MANAGEMENT** **Financial Management:** Fixed and working capital – Resources of capital – shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – direct cost –	**16**

	indirect cost – Factory overhead – Selling price of a product – Profit – Problems. Depreciation – Causes – Methods - Straight line, sinking fund and percentage on diminishing value method – Problems. **Material management:** Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum Stock, Lead Time, Reorder Level-Economic order quantity problems – supply chain management – Introduction – Purchasing procedure – Store keeping – Bin card.	

Text Books :

1) Industrial Engineering and Management, O.P. Khanna, Revised Edition Publications (P) Ltd – 2004, 67/4 Madras House, Daryaganj, New Delhi – 110002.
2) Engineering Economics and Management, T.R. Banga & S.C. Sharma, McGraw Hill Editiion. 2 – 2001, New Delhi.
3) Herald Koontz and Heinz Weihrich,'Essentials of Management',McGraw Hill Publishing Company,Singapore International Edition.Latest

Reference Books :

1) Management, A global perspective, Heinz Weihrich, Harold Koontz, 10th Edition, McGraw Hill International Edition.Latest.
2) Essentials of Management, 4th Edition, Joseph L.Massie, Prentice-Hall of India, New Delhi 2004.
3) S.Chandran,Organizational Behaviours,Vikas Publishing House Pvt. Ltd. Latest
4) M.Govindarajan and S.Natarajan,Principles of Management,Prentce Hall of India Pvt.Ltd.New Delhi.Latest.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

32062 - COMPUTER AIDED DESIGN AND MANUFACTURING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

Course Code : 1220

Subject Code : 32062

Semester : VI

Subject Title : COMPUTER AIDED DESIGN AND MANUFACTURING

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
Computer Aided Design and Manufacturing	Hours / Week	Hours / Semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	COMPUTER AIDED DESIGN	14
II	COMPUTER AIDED MANUFACTURING	14
III	CNC PROGRAMMING, RAPID PROTOTYPING	14
IV	COMPUTER INTEGRATED MANUFACTURING, FLEXIBLE MANUFACTURING SYSTEMS, AUTOMATIC GUIDED VEHICLE, ROBOT	13
V	CONCURRENT ENGINEERING, QUALITY FUNCTION DEPLOYMENT, PRODUCT DEVELOPMENT CYCLE, AUGMENTED REALITY.	13
	REVISION AND TEST	7
	Total	**75**

RATIONALE:

As per the latest requirements in the Industries this enables to learn the assistance of computer in the field of design and manufacturing areas. It's able to learn the latest manufacturing concepts of in the shop floors and manufacturing methods like RPT. They are able to know about the CNC programming techniques are included.

OBJECTIVES:

- Understand the concept and requirement of the integration of the design and manufacturing.
- Acquire knowledge about the computer assistance in the design process and analysis.
- Understand the concepts of manufacturing with computer assistance in the shop floor.
- Understand the principle of latest manufacturing machines like RPT.
- Acquire the knowledge in the material handling equipment and robot.
- Understand the Computer Integrated Manufacturing and FMS.
- Study of Concurrent Engineering and its tools and Augmented Reality.

COMPUTER AIDED DESIGN AND MANUFACTURING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**COMPUTER AIDED DESIGN** **Computer Aided Design:** Introduction – definition – Shigley's design process – Ohsuga Model - CAD activities – benefits of CAD - CAD software packages. **Transformations:** 2D & 3D transformations – translation, scaling, rotation and concatenation. **Geometric modelling:** Techniques - Wire frame modelling – applications – advantages and disadvantages. Surface modelling – types of surfaces – applications – advantages and disadvantages –	**14**

	Solid modelling – entities – advantages and disadvantages – Boolean operations - Boundary representation – Constructive Solid Geometry – Comparison. **Graphics standard**: Definition – Need - GKS – OpenGL - IGES – DXF. **Finite Element Analysis:** Introduction – Development - Basic steps – Advantage.	
II	**COMPUTER AIDED MANUFACTURING** **Computer Aided Manufacturing:** Introduction - Definition – functions of CAM – benefits of CAM. **Group technology**: Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System. **Process Planning:** Introduction – Computer Assisted Process Planning (CAPP) – Types of CAPP - Variant type, Generative type – advantages of CAPP. **Production Planning and Control (PPC):** Definition – objectives - Computer Integrated Production management system – Master Production Schedule (MPS) – Capacity Planning – Materials Requirement Planning (MRP) – Manufacturing Resources Planning (MRP-II) – Shop Floor Control system (SFC) - Just In Time manufacturing philosophy (JIT) - Introduction to Enterprise Resources Planning (ERP).	**14**
III	**CNC PROGRAMMING, RAPID PROTOTYPING** **CNC PART PROGRAMMING:** Manual part programming - coordinate system – Datum points: machine zero, work zero, tool zero - reference points - NC dimensioning – G codes and M codes – linear interpolation and circular interpolation - CNC program procedure - sub-program – canned cycles - stock removal – thread cutting – mirroring – drilling cycle – pocketing. **Rapid prototyping:** Classification – subtractive – additive – advantages and applications - materials. Types - Stereo lithography	**14**

	(STL) – Fused deposition model (FDM) – Selective laser sintering SLS) - three dimensional printing (3D) – Rapid tooling.	
IV	**COMPUTER INTEGRATED MANUFACTURING, FLEXIBLE MANUFACTURING SYSTEMS, AUTOMATIC GUIDED VEHICLE, ROBOT** **CIM:** Introduction of CIM – concept of CIM - evolution of CIM – CIM wheel – Benefits – integrated CAD/CAM. **FMS:** Introduction – FMS components – FMS layouts – Types of FMS: Flexible Manufacturing Cell (FMC) – Flexible Turning Cell (FTC) – Flexible Transfer Line (FTL) – Flexible Machining System (FMS) – benefits of FMS - introduction to intelligent manufacturing system. **AGV**: Introduction – AGV - working principle – types – benefits. **ROBOT:** Definition – robot configurations – basic robot motion – robot programming method – robotic sensors – end effectors – mechanical grippers – vacuum grippers - Industrial applications of Robot**:** Characteristics - material transfer and loading – welding - spray coating - assembly and inspection.	**13**
V	**CONCURRENT ENGINEERING, QUALITY FUNCTION DEPLOYMENT, PRODUCT DEVELOPMENT CYCLE, AUGMENTED REALITY.** **Concurrent Engineering:** Definition – Sequential Vs Concurrent engineering – need of CE – benefits of CE. **Quality Function Deployment** (QFD)**:** Definition – House of Quality (HOQ) – advantages – disadvantages. Steps in Failure Modes and Effects Analysis (FMEA) – Value Engineering (VE) – types of values – identification of poor value areas – techniques – benefits. Guide lines of Design for Manufacture and Assembly (DFMA). **Product Development Cycle:** Product Life Cycle - New product development processes. **Augmented Reality (AR)** – Introduction - concept – Applications.	**13**

Text Books :

1) CAD/CAM/CIM , R.Radhakrishnan, S.Subramanian, New Age International Pvt. Ltd.
2) CAD/CAM , Mikell P.Groover, Emory Zimmers, Jr.Prentice Hall of India Pvt., Ltd.

Reference Books:

1) CAD/CAM Principles and Applications, Dr.P.N.Rao, Tata Mc Graw Hill Publishing Company Ltd.
2) CAD/CAM, Ibrahim Zeid, Mastering Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3) Automation, Production Systems, and Computer-Integrated Manufacturing, Mikell P. Groover, Pearson Education Asia.
4) Computer control of manufacturing systems, Yoram Koren, McGraw Hill Book.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

32263 - PLASTIC MOULDING TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32263
Semester : VI
Subject Title : **PLASTIC MOULDING TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 15 weeks

SUBJECT	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration (Hrs)
			Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
PLASTIC MOULDING TECHNOLOGY	**5**	**75**	**25**	**75**	**100**	3

Topics and Time allocation

UNIT	TOPIC	TIME (Hrs)
I	Plastic Materials and Processing techniques	14
II	Injection Moulding Machine, Injection Mould and its functional system	14
III	Injection Mould Design	14
IV	Compression, Blow and Transfer moulding machine and Mould Design	14
V	Plastic Product Design , Decoration of Plastic Products & Maintenance and repairs of injection moulds	14
	TEST & REVISION	05
	Total	75

RATIONALE: -

Plastic plays an important role in the present day industrial products and for the manufacture of plastic components lot of moulds are used. Hence Considering the immense potential in the fields of Plastic processing, mould design, making and maintenance, it is essential to understand the basics of plastic materials, processing and moulding technology adopted to convert the raw plastic material into desired products.

OBJECTIVES

- Familiarise different plastics materials and their properties
- Familiarise of the conventional injection-moulding machine types, their specification,

  operation terminology and their parts.
- Compare different moulding processes used in industries, their application
- Explain the design procedure for injection moulding.
- Explain the design procedure for compression moulding
- Explain the concepts in the design of blow moulds.
- Appreciate the decoration techniques, plating techniques used for plastic components.
- Explain the working of injection moulding machine
- Understand the intermediate injection moulding design concepts

32263 - PLASTIC MOULDING TECHNOLOGY

DETAILED SYLLABUS

Contents: Theory

Unit No.	Name of the Topics	Hours
I	**Plastic Materials and Processing techniques** **1.0 Plastics:** Introduction – type of Plastics - Thermo Plastic Materials – Thermo setting Materials – Commodity Plastics – Engineering materials – Density - Melting Temperature – Shrinkage – Bulk Factor – Moulding Properties – Applications – Additives - Master Batches – Pigments. **Injection Moulding:** Hot Runner Injection Moulding Process, Multi colour and multi component Injection Moulding Process, Reaction Injection Moulding Process**.** **1.2 Blow Moulding**: concept and working principle only **1.3 Compression & Transfer Moulding** – Compression Moulding Procedure- Difference between Injection and Compression moulding.- Transfer Moulding -Advantages and Disadvantages. **1.4 Other processes:** Rotational Moulding, Thermoforming, Extrusion- Pipe extrusion, Blown film, Cast film extrusion, Rod Extrusion– Co extrusion,	14
II	**Injection Moulding machine, injection mould and its functional systems** **2.1 Injection Moulding Machines:** Basic parts and functioning of an injection moulding machine. Types of injection moulding machine (Screw type & Plunger Type) – Single stage and two stage – Clamping unit (Toggle & Hydraulic) - Types of nozzles – Typical injection. Moulding cycle, Cycle time - Machine specifications (Definition only). **2.2 Injection Mould: - Terms** used in connection with injection moulds, classification of moulds, Functions of the injection moulds**.** **2.3 Functional systems of injection mould** – **Sprue and runner system**	14

	- Runner, Cross section shape, Runner size, Runner layout – Gates, Necessity, Centre gate, Edge gate, Balanced gating, Types of Gates. **Core and Cavity-** Shrinkage calculation - Core and cavity dimension. **Parting surface:** Flat Parting surface – Non flat parting surface - Venting – Mould clamping - direct, indirect. **2.4 Cooling System** – Cooling Integer type cavity plates – Cooling integer type core plate - Cooling bolster – Cooling cavity inserts – Cooling core inserts – Water connection and seals. (Concept & Description of design only) **2.5 Ejection system**: Ejector grid - Ejector plates assembly – Ejector rod, Ejector plate and ejector retaining plate - Methods of Ejection – Ejection from fixed half- Sprue puller.	

III	**Injection Mould Design & Intermediate Moulds** **3.1 –Basic procedure for mould design –** Determination of mould size – Maximum number of cavities, Clamping force , Maximum clamping area, Required opening stroke. Computation of number of cavities, cavity layouts, number of parting lines, Design of runner and gate. **3.2 Intermediate Moulds:** Moulding external undercuts-Split mould - Finger cam, dog leg cam & track. Hydraulic & spring actuation of split - Side core and side cavity, Methods of actuation - Mould with internal undercut : Form pin, actuation, split core, jumping off - Mould for threaded component: Manual & automatic unscrewing methods hand mould for rotating & lose core methods - Multi day light mould – Under feed mould – Triple day light mould – Hot runner unit mould, Advantages and Limitations, Hot runner nozzles & sprue, runner less mould - Materials for Injection Mould – Standard Mould systems, Advantages and limitations **(**Concept & Description of design only). **3.3 Alignment of Moulds**: Functions of alignment, alignment with the axis of the plasticizing unit, internal alignment and interlocking, alignment of large moulds. Changing of moulds – system for a quick change of moulds for thermoplastics, mould exchanger for elastomer moulds.	14
IV	**Compression, Blow and Transfer Moulding machines and Mould Design** 4.**1 Compression & Transfer Moulding Machines**: - Type of compression Moulding Machine – Toggle type mechanical machine – Hydraulically operated Machine – Auxiliary Ram type machines (Vertical Transfer Machine) – Bottom Transfer Machine – Machine Parts – Machine Specifications- Pot and plunger Transfer machines **4.2 Compression mould Design:** Economic determination of no. of cavities, flash thickness allowances, design of mould cavity, design of loading chamber, bulk factor, loading chamber depth & heat requirement for heating the mould related to - curing time, breathing time. Materials for Compression mould.	14

	4.3 Blow moulding Machines - Extrusion Blow Moulding Machine (EBM) – Stretch Blow Moulding Machine (SBM) – Injection Blow Moulding Machine (IBM) – Machine Parts – Machine Specifications. **4.4 Blow Mould Design:** Mould layout, Pinch off, venting, Head die design, parison diameter calculation, shrinkage calculation, design of mould clamping accessories.	
V	**Plastic Product Design, Decoration of Plastic Products and Maintenance & Repair of Injection Moulds:** **5.1 Plastic Product Design:** Wall thickness - Ribs and profiled structures – Gussets or support ribs - Bosses - Holes - Radii & Corners - Tolerances - Coring - Undercuts – Draft angle. **5.2 Decoration of Plastic Parts:** Painting and coating (Dipping, Spraying and Depositing) – Metalizing (Vacuum metallization, Vacuum evaporation, sputtering) – Plating (Electroless plating, Electrolytic plating) - Flame and arc spraying - hot foil stamping – hot transfer – In mold decorating - Water transfer – Printing– Laser Marking, Vapor polishing, Decals - Understanding Recycling Codes. **5.3 Maintenance of Injection Moulds:** Advantages of Preventive maintenance, maintenance of - cooling lines, mould surfaces, heating & control systems. Action taken after examination and cleaning. Repair and alterations of injection moulds.	14
	TEST & REVISION	05

Text Books:

1. Pye.R.G.W., "Injection Mould Design", Affiliated East – west press pvt Ltd, 2000
2. Athalye.A.S., 'Injection Moulding", 2nd Edn., Multi Tech Publishing Co., 1998
3. George menges and Paul mohren, “How to make Injection moulds”, Hawer publishers, 1991

Reference Books:

1. Briston and Gosselin, “Introduction to Plastics", Newnes-Butterworths, London, 1970
2. Mills.N.J., “Plastics", ELBS, 1986
3. Dominick V.Rosato and Donald V.Rosato., "Injection Moulding Hand Book", CBS Publishers & Distributors, Delhi, 1987
4. Athalye.A.S., "Plastics Materials Handbook", Multi Tech Publishing Co., 1995
5. Athalye.A.S., "Moulding of Plastics", Multi Tech Publishing Co., 1998.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

32064 - COMPUTER AIDED DESIGN & MANUFACTURING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING(TOOL & DIE)

Course Code : 1220

Subject Code : 32064

Semester : VI

Subject Title : COMPUTER AIDED DESIGN AND MANUFACTURING PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

<table>
<tr><th>Subject</th><th colspan="2">Instructions</th><th colspan="4">Examination</th></tr>
<tr><td rowspan="3">Computer Aided Design and Manufacturing Practical</td><td>Hours/ Week</td><td>Hours/ Semester</td><td colspan="3">Marks</td><td>Duration</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">90</td><td>Internal Assessment</td><td>Board Examination</td><td>Total</td><td rowspan="2">3 Hrs</td></tr>
<tr><td>25</td><td>75</td><td>100</td></tr>
</table>

OBJECTIVES:

- Study of parametric modeling.
- Understand the part modeling and assembly of parts
- Create the views of the solid model and parts list.
- Study the working principle of CNC machines
- Study the datum points and offsets.
- Differentiate incremental System with absolute system
- Study the simulation software package.
- Write program and simulate in the Lathe software and Milling software.
- Prepare a part program, edit and execute in CNC Turning centre.
- Prepare a part program, edit and execute in CNC Machining centre.

- Produce components in the CNC Turning centre and CNC Machining centre.

PART A: Solid modeling (30 Hrs.)

Introduction

Part modelling - Datum Plane – constraint – sketch – dimensioning – extrude – revolve – sweep – blend – protrusion – extrusion – rib – shell – hole – round – chamfer – copy – mirror – assembly – align – orient.

Exercises

3D Drawing

1. Geneva Wheel
2. Bearing Block
3. Bushed bearing
4. Gib and Cotter joint
5. Screw Jack
6. Connecting Rod

Note: Print the orthographic view and sectional view from the above assembled 3D drawing.

PART B: CNC Programming and Machining (45 Hrs.)

Introduction:

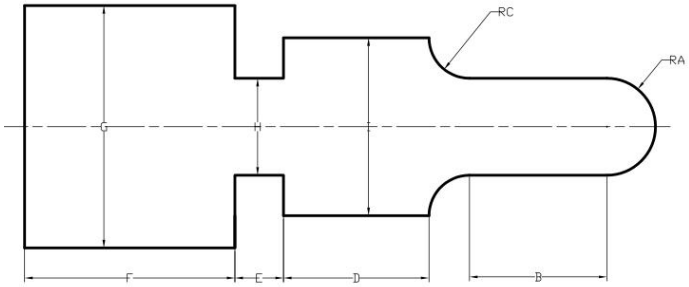
1. Study of CNC lathe, milling.
2. Study of international standard codes: G-Codes and M-Codes
3. Format – Dimensioning methods.
4. Program writing – Turning simulator – Milling simulator, IS practice – commands menus.
5. Editing the program in the CNC machines.
6. Execute the program in the CNC machines.

Exercises

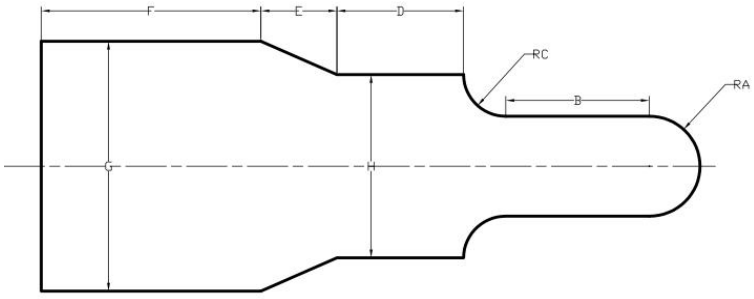
Note: Print the part program from the simulation software and make the component in the CNC machine.

CNC Turning Machine **Material:** M.S **/** Aluminum / Acrylic fibre / Plastic

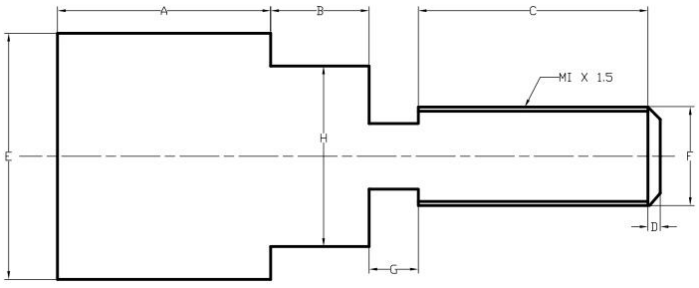
1. Using Linear and Circular interpolation - Create a part program and produce component in the Machine.



2. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine.

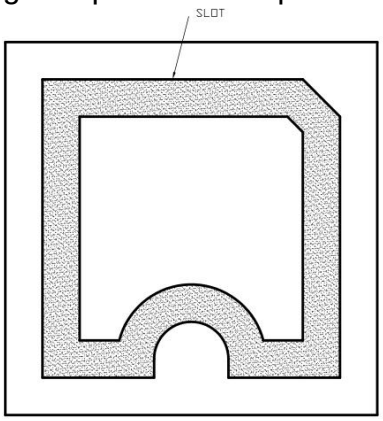


3. Using canned cycle - Create a part program for thread cutting, grooving and produce component in the Machine.

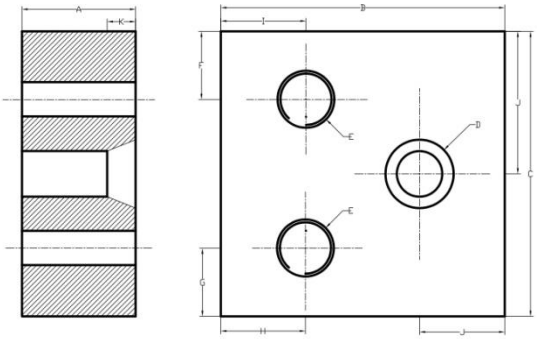


CNC Milling Machine **Material:** M.S / Aluminum / acrylic fibre / plastic

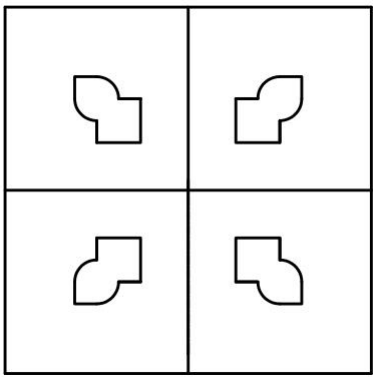
4. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine.



5. Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine.



6. Using subprogram - Create a part program and produce component in the Machine.



Reference:

CNC Programming & Operations, Sankar, Sathish and Balamurugan – Micro Publications, Tiruchy.

BOARD EXAMINATION

Note: All exercises should be completed. Two exercises should be carried out by selecting one exercise in each section. The printouts must be kept along with the examination paper.

Allocation of marks for Board Examination

PART –A: SOLID MODELING			**35**
Part modelling	:	15	
Assembly	:	10	
Printout	:	10	
PART-B: CNC PROGRAMING			**35**
Program editing and creation	:	15	
Component manufacturing	:	10	
Finish	:	10	
Viva voice	**:**		**5**
Total	**:**		**75**

LIST OF EQUIPMENTS

1. Personal computer - 30 Nos.
2. CNC programming software - Sufficient to the strength.
   (Lathe and Milling)
3. Modelling package - Sufficient to the strength.
   (Solid works / Pro-E / Catia / Unigraphics / Autocad etc…)
4. CNC Turning Machine - 1 No.
5. CNC Milling Machine - 1 No.
6. Laser Printer - 1 No.
7. Consumables - Sufficient quantity.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

32265 - PRESS TOOLS-II PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32265
Semester : VI
Subject Title : **PRESS TOOLS-II PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 15 weeks

SUBJECT	Instructions		Examination			
			Marks			Duration (Hrs)
	Hours/ Week	Hours/ Semester	Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
PRESS TOOLS-II PRACTICAL	4	60	25	75	100	16

Objectives

At the end of the practice, the students will be able to

- Manufacture press tool components as per the given drawing.
- Assemble the components manufactured.
- Set the tools manufactured in the OBI . gap frame press.
- Adjust the shut height , operate the press to take trial production.
- Compare the result with the requirement and to do the necessary corrections if needed.
- Train the students on tool maintenance and wear correction to increase the life of the tool and to restore the process capability of the tool.

DETAILED SYLLABUS

Ex. No.	Name of the exercise	Time in Hours
1.	Manufacture of V Bending tool	**12**
2.	Manufacture of Edge bending tool	**12**
3.	Manufacture of drawing tool (single stage)	**18**
4.	Manufacture of combination Tool	**18**
	TOTAL	**60**

Note:-

1. Batch size should not be more than 5 students for class work.

2. For examination, exercise Should be given to students individually and not in batches.

3. The examination duration is 16 hours.

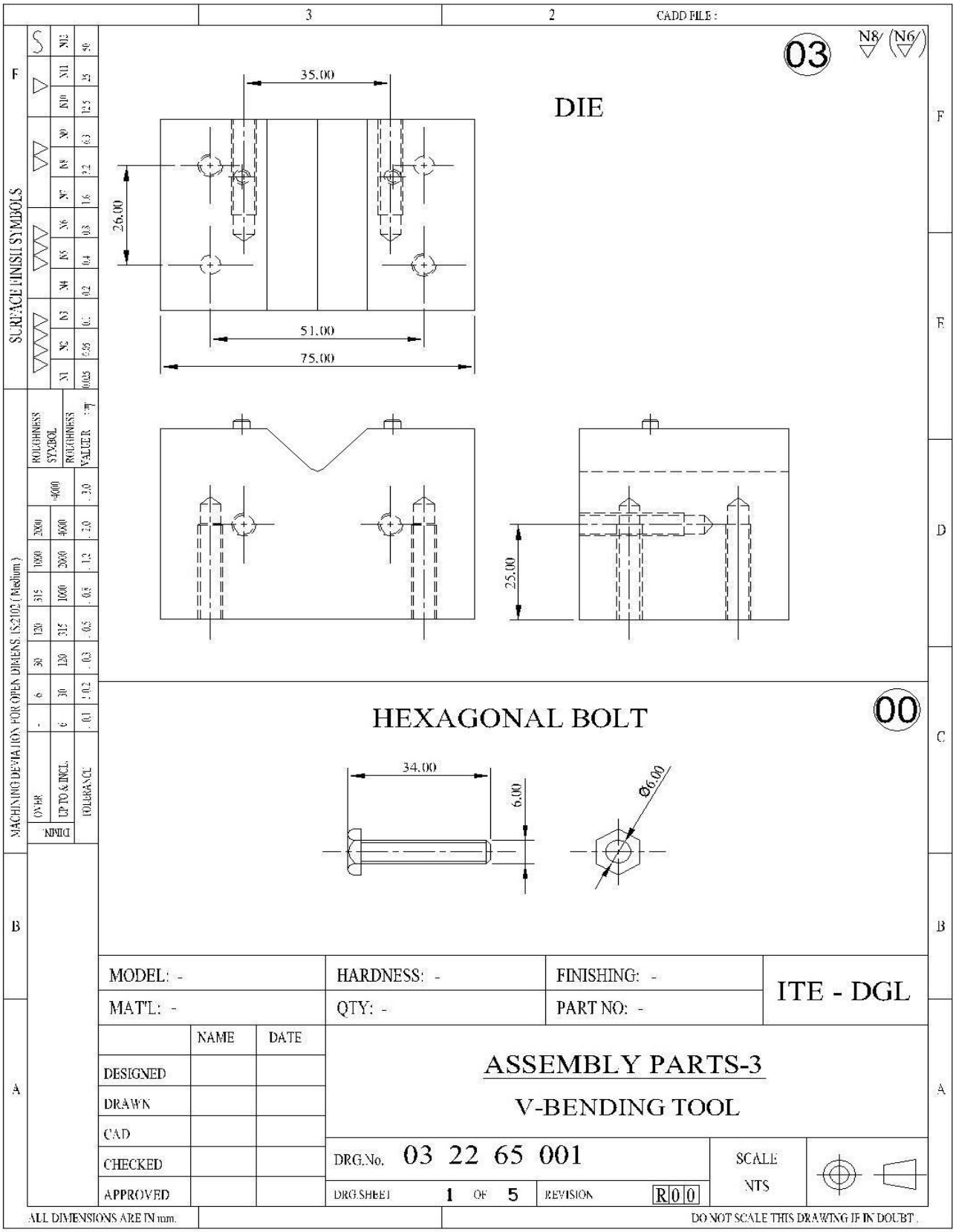
4. Students should be trained in Press Setting, Tool setting, shut height Adjustment, trial production using the tool fabricated by them and rectification of tool defects if any.

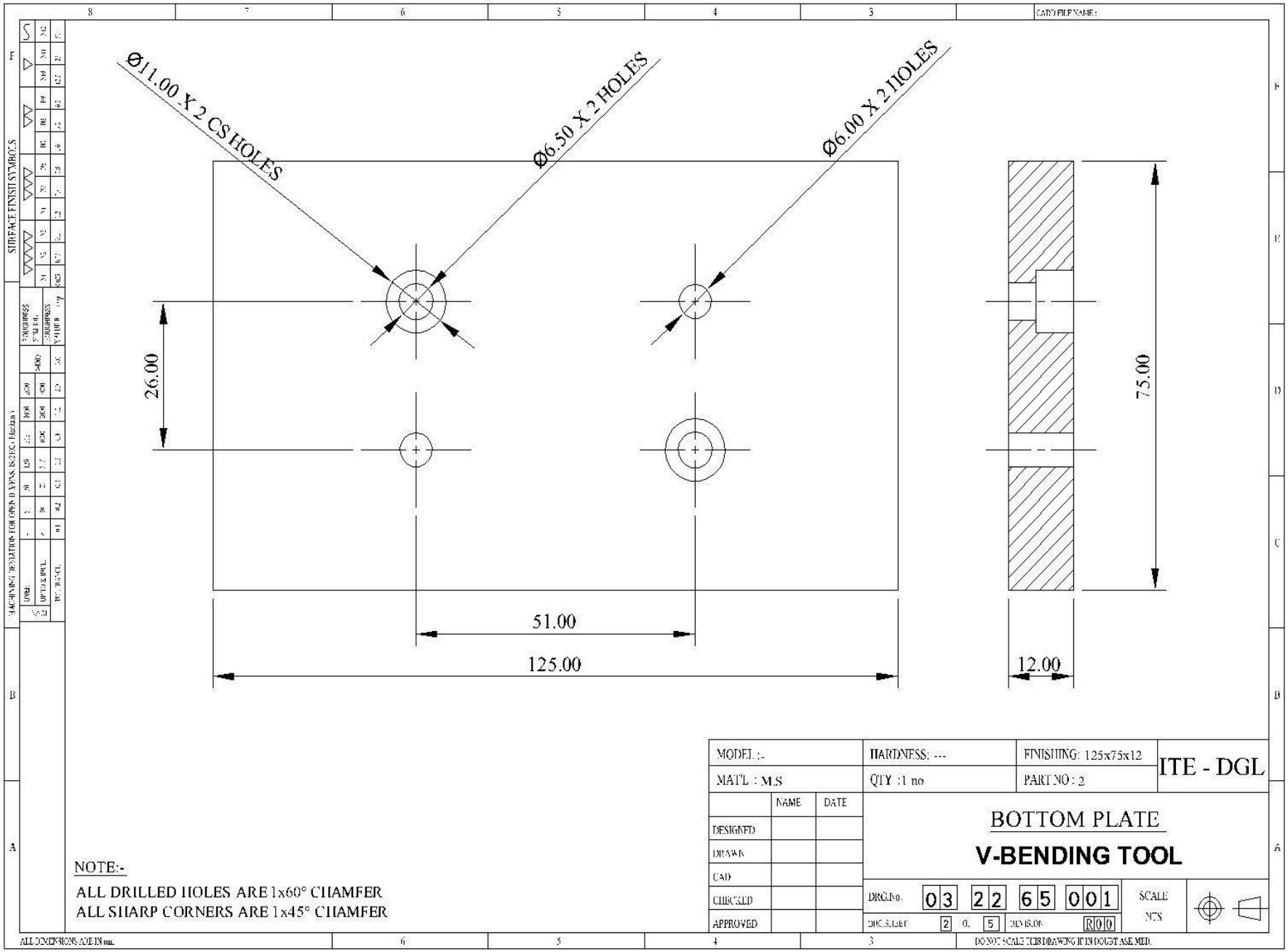
5. For Board examination any one of the above tool (sl.no 1 to 4) is to be manufactured, fitted in the press and trial production should be taken. The evaluation of the performance should be based on the component dimensions and finish obtained from the tool fabricated by the student during the 16 hours examination.

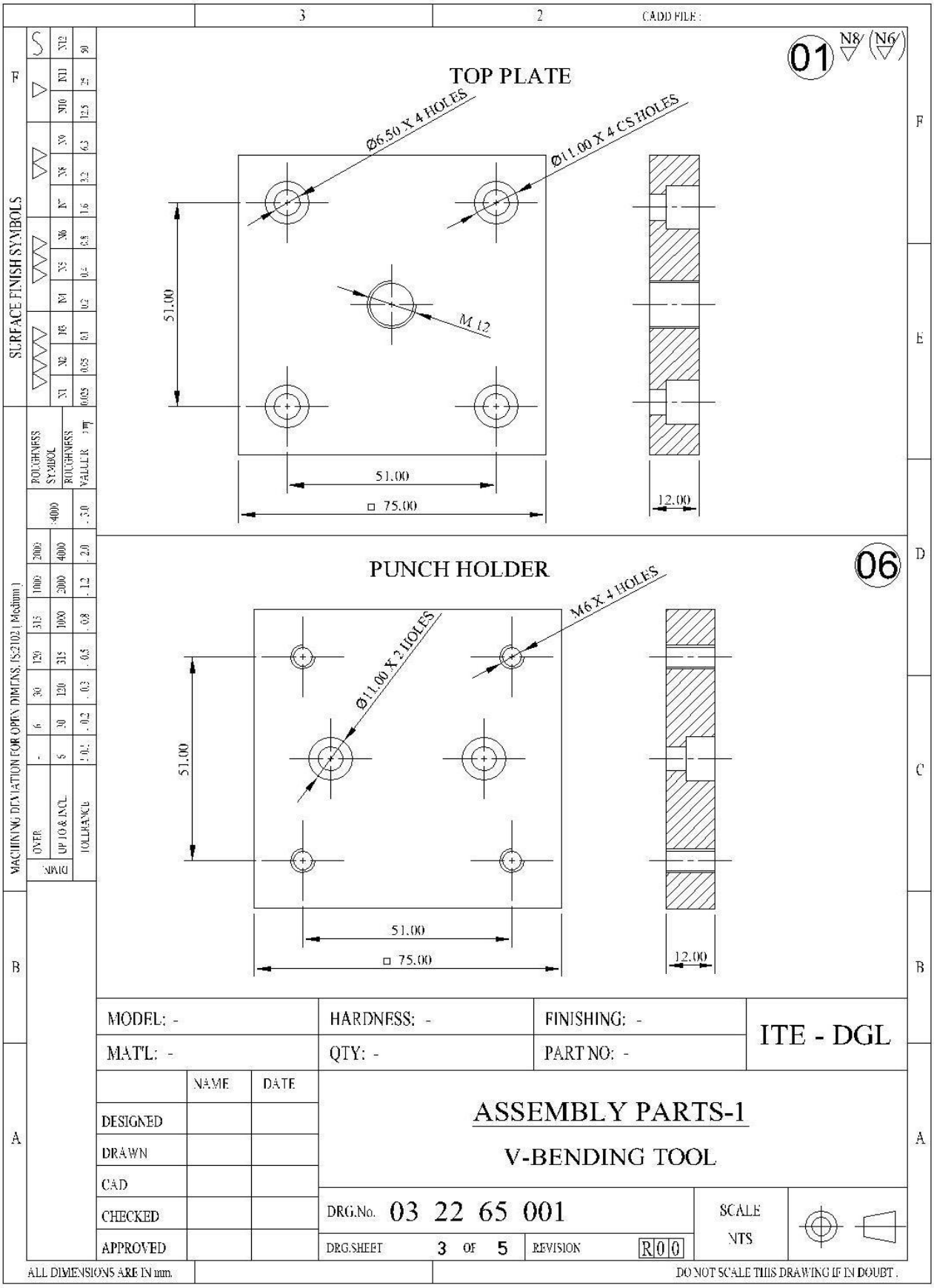
SCHEME OF EXAMINATION:

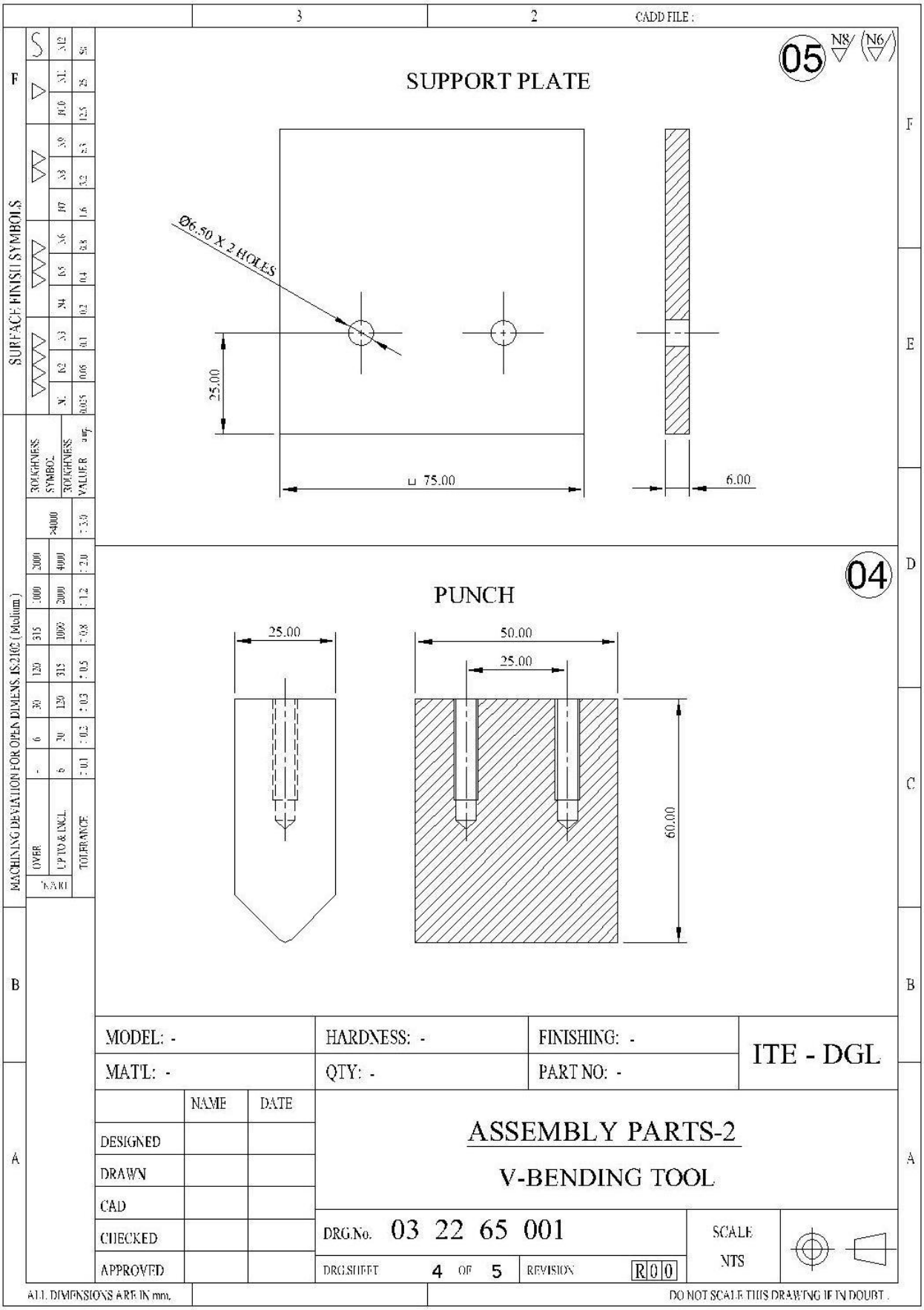
Manufacture of Tool	-	25marks
Tool finish	-	20 marks
Component finish / accuracy	-	10 marks
Tool setting & trial production	-	10 Marks
Viva Voce on die maintenance	-	10 Marks
Total	-	75 Marks

Exercise – I V-Bending Tool

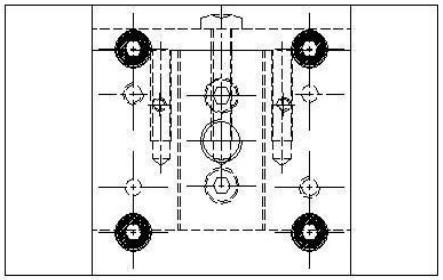



Ø11.00 X 2 CS HOLES
Ø6.50 X 2 HOLES
Ø6.00 X 2 HOLES
26.00
75.00
51.00
125.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 125x75x12
ITE - DGL
MAT'L : M.S
QTY :1 no
PART NO : 2
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BOTTOM PLATE
V-BENDING TOOL
DRG.No. 03 22 65 001
SCALE NTS
DRG.SHEET 2 0. 5
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME/D.


CADD FILE :
01
N8 (N6)
TOP PLATE
Ø6.50 X 4 HOLES
Ø11.00 X 4 CS HOLES
M 12
51.00
51.00
□ 75.00
12.00
06
PUNCH HOLDER
M6 X 4 HOLES
Ø11.00 X 2 HOLES
51.00
51.00
□ 75.00
12.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. (IS:2102 | Medium)
MODEL: -
HARDNESS: -
FINISHING: -
MAT'L: -
QTY: -
PART NO: -
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
V-BENDING TOOL
DRG.No. 03 22 65 001
SCALE NTS
DRG.SHEET 3 OF 5
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

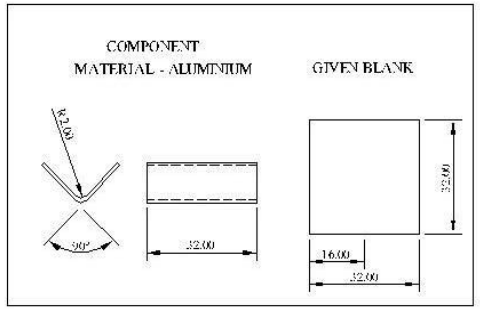

CADD FILE :
05
SUPPORT PLATE
Ø6.50 X 2 HOLES
25.00
75.00
6.00
04
PUNCH
25.00
50.00
25.00
60.00
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
MAT'L: -
QTY: -
PART NO: -
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-2
V-BENDING TOOL
DRG.No. 03 22 65 001
DRG.SHEET 4 OF 5
REVISION R 0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

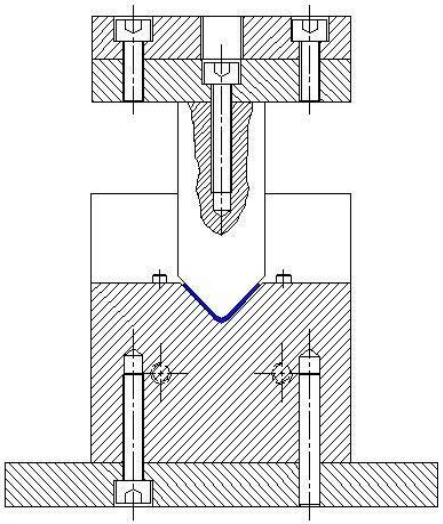
PLAN



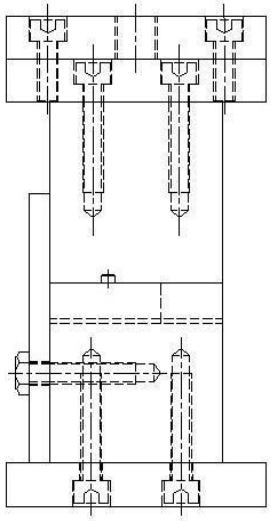
NOTE

1. ALL DIMENSIONS ARE IN mm
2. PROVIDE PUNCH/DIE CLEARENCE PERSIDE AS 0.001
3. THE DIE PLATE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC
4. THE PUNCH SHALL BE HARDENED TO 60-62 HRC
5. AVOID SHARP CORNERS
6. FOR DIMENSIONS WITHOUT TOLERANCE SHALL BE PROVIDED AS ISO 2768-1





ELEVATION



SIDE VIEW

BILL OF MATERIALS

S.NO	DESCRIPTION	MATERIAL	QUANTITY
1	TOP PLATE	M.S	1
2	BOTTOM PLATE	M.S	1
3	DIE	MS	1
4	PUNCH	MS	1
5	SUPPORT PLATE	MS	1
6	PUNCH HOLDER	MS	1
7	DOWEL	STD	2
8	ALLEN SCREW	STD	8
9	HEXAGONAL NUT	STD	2
10	LOCATING PIN	STD	2

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

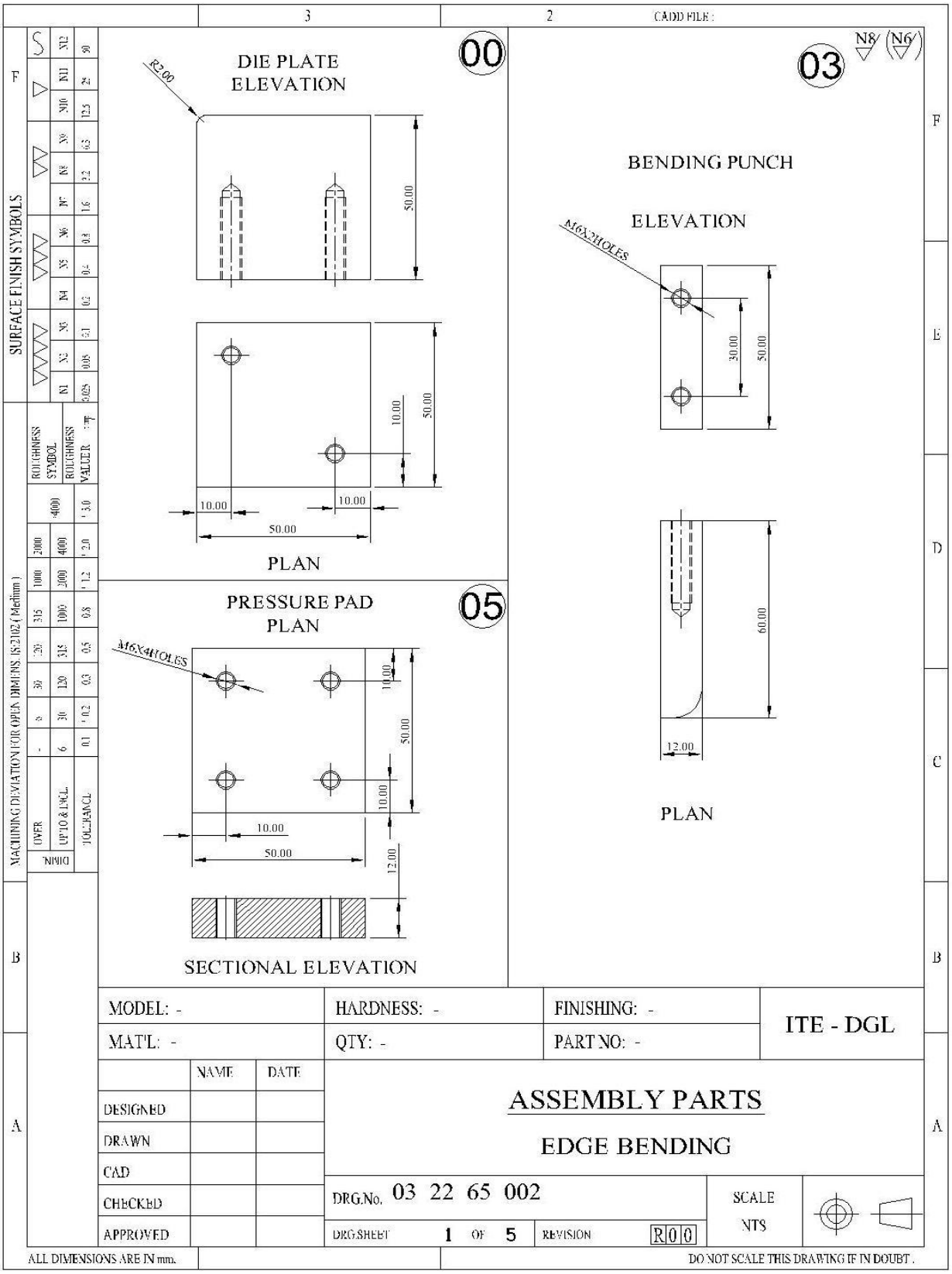
V-BENDING TOOL

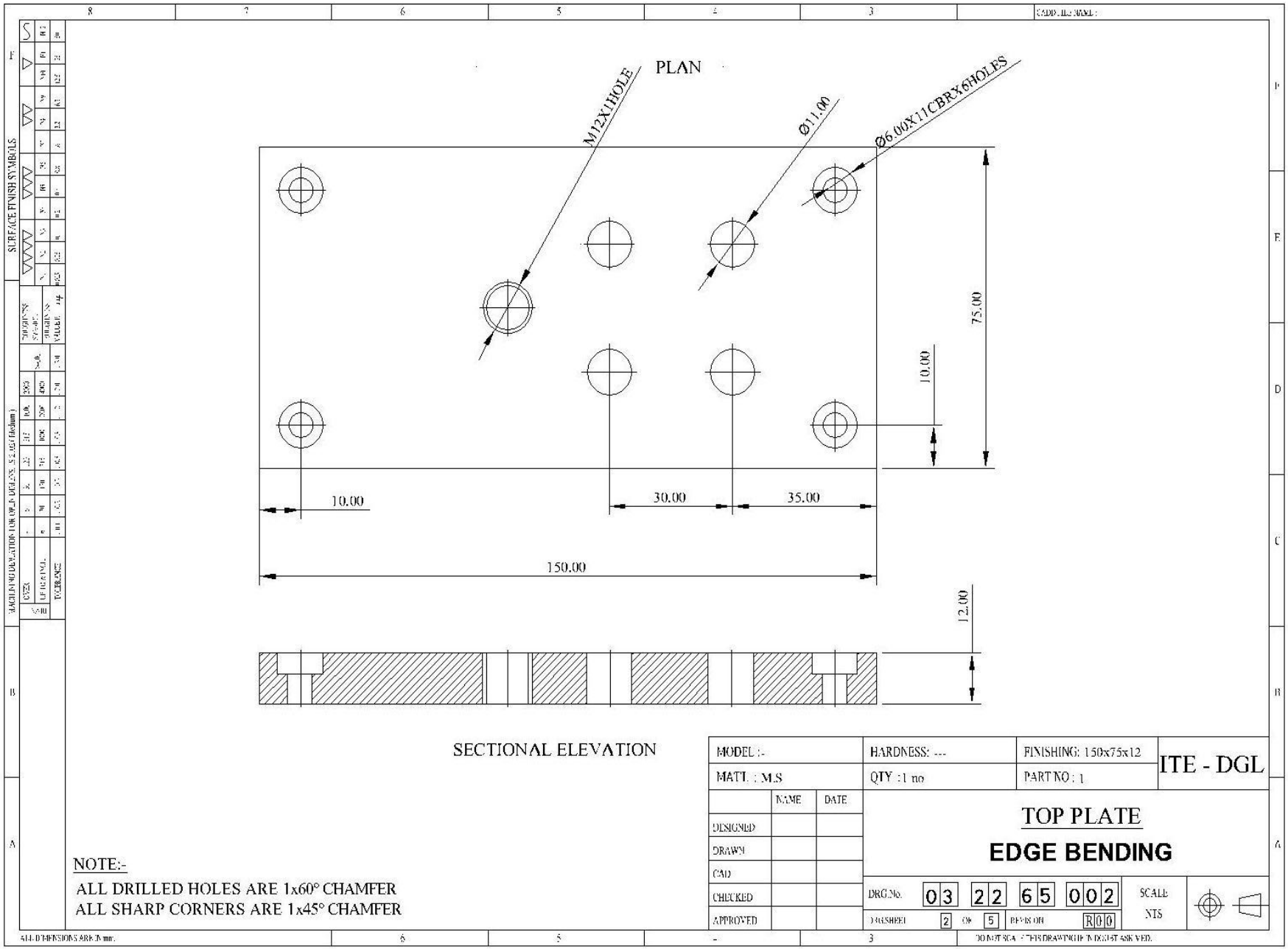
DRG.No. 03 22 65 001 SCALE NTS

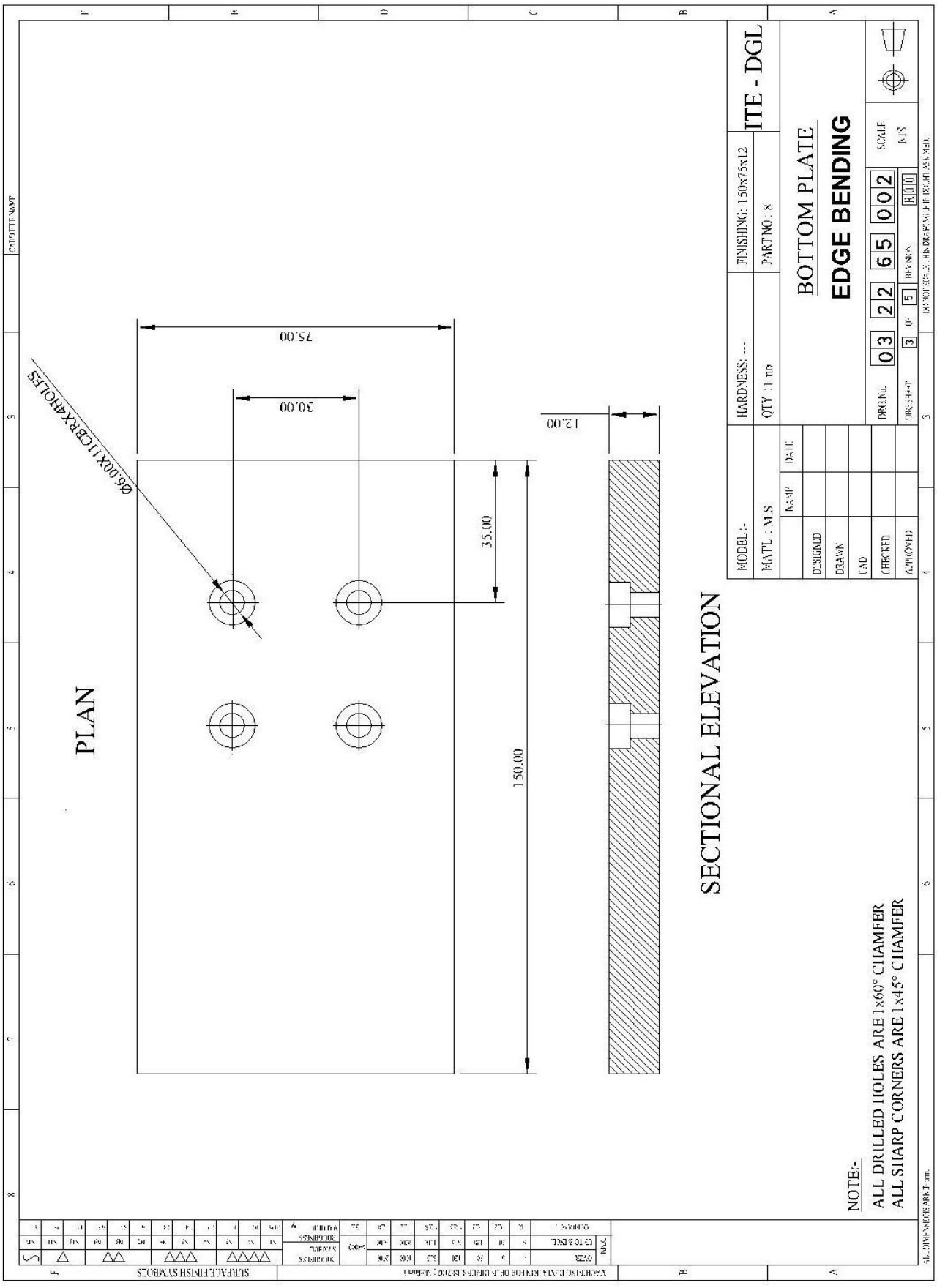
DRG.SHEET 5 OF 5 REVISION R00

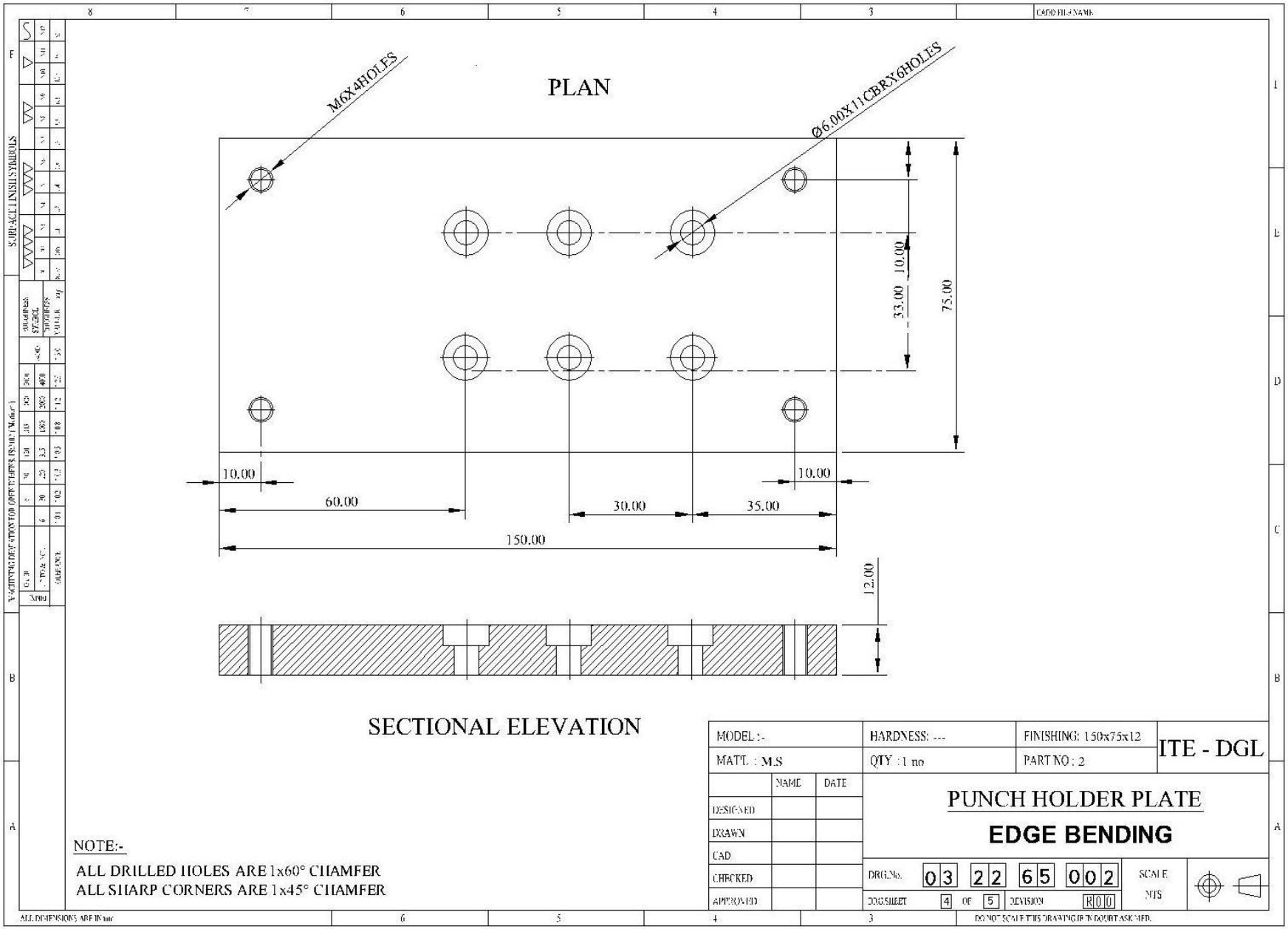
ALL DIMENSIONS ARE IN mm. DO NOT SCALE THIS DRAWING IF IN DOUBT, ASK MID

Exercise – II Edge Bending Tool




PLAN
M12X1HOLE
Ø11.00
Ø6.00X11CBR3.6HOLES
75.00
10.00
10.00
30.00
35.00
150.00
12.00
SECTIONAL ELEVATION
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 150x75x12
ITE - DGL
MATL : M.S
QTY :1 no
PART NO : 1
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP PLATE
EDGE BENDING
DRG.No. 03 22 65 002
SCALE NTS
SHEET 2 OF 5
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DIGITAL MODE.


PLAN
SECTIONAL ELEVATION
75.00
30.00
35.00
150.00
12.00
Ø6.00X11CBRX4HOLES
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
BOTTOM PLATE
EDGE BENDING
ITE - DGL
MODEL :-
MATL : M.S
HARDNESS: ---
QTY : 1 no
FINISHING: 150x75x12
PART NO. : 8
DRGNo. 03 22 65 002
SCALE
NTS


PLAN
M6X4HOLES
Ø6.00X11CBRY6HOLES
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75.00
10.00
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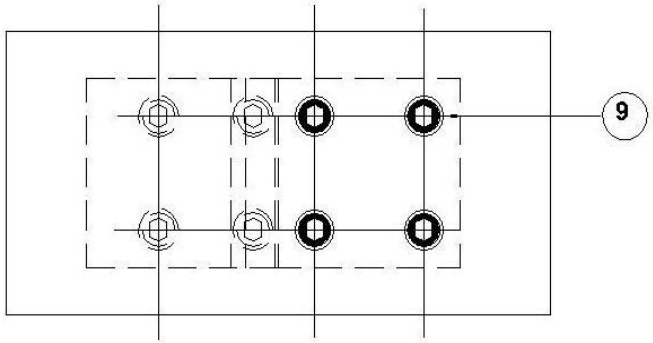
60.00
30.00
35.00
150.00
12.00
SECTIONAL ELEVATION
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :-
HARDNESS: ---
FINISHING: 150x75x12
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : 2
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
PUNCH HOLDER PLATE
EDGE BENDING
DRG.No. 03 22 65 002
SCALE NTS
DRG SHEET 4 OF 5
REVISION R00

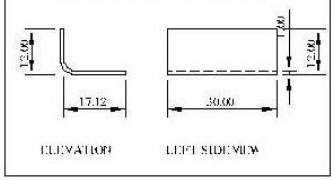
PLAN

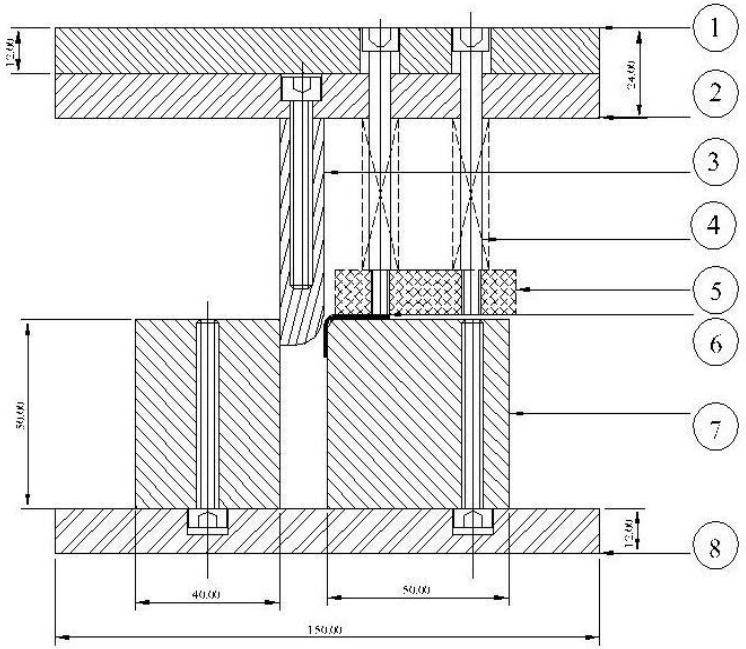


NOTE ;

1. **ALL DIMENSIONS ARE IN mm**
2. **PROVIDE PUNCH/DIE CLEARANCE PER SIDE 0.001**
3. THE DIE PLATE SHALL BE HARDENED AND TERMPERED TO 60 - 62 HRC
4. AVOID SHARP CORNERS
5. THE PUNCH SHALL BE HARDEND TO 60 - 62 HRC
6. FOR DIMENSIONS WITHOUT TOLERANCE SHALLBE PROVIDE AS ISO 2768 - 1

COMPONENT DRAWING





SECTIONAL ELEVATION

BILL OF MATERIALS

SL NO	NAME	MATERIAL	QUANTITY
9	ALLEN SCREW M6	STD	10
8	BOTTOM PLATE	MS	1
7	DIE BLOCK	MS	1
6	**COMPONENT**	ALUMINIUM	1
5	PRESSURE PAD	MS	1
4	SPRING	STD	4
3	PUNCH	MS	1
2	PUNCH HOLDER	MS	1
1	TOP PLATE	MS	1

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL :	QTY :	PART NO :	

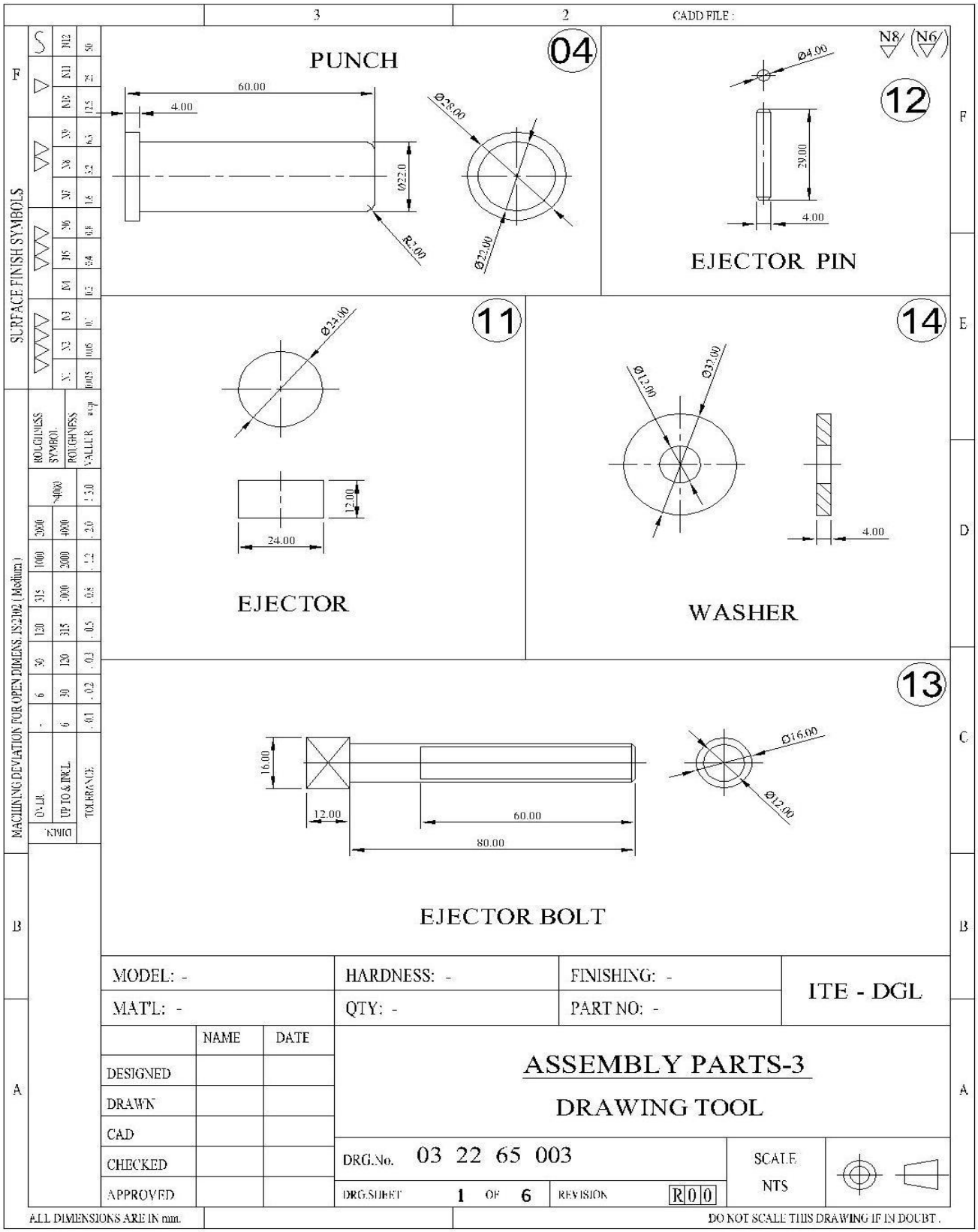
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

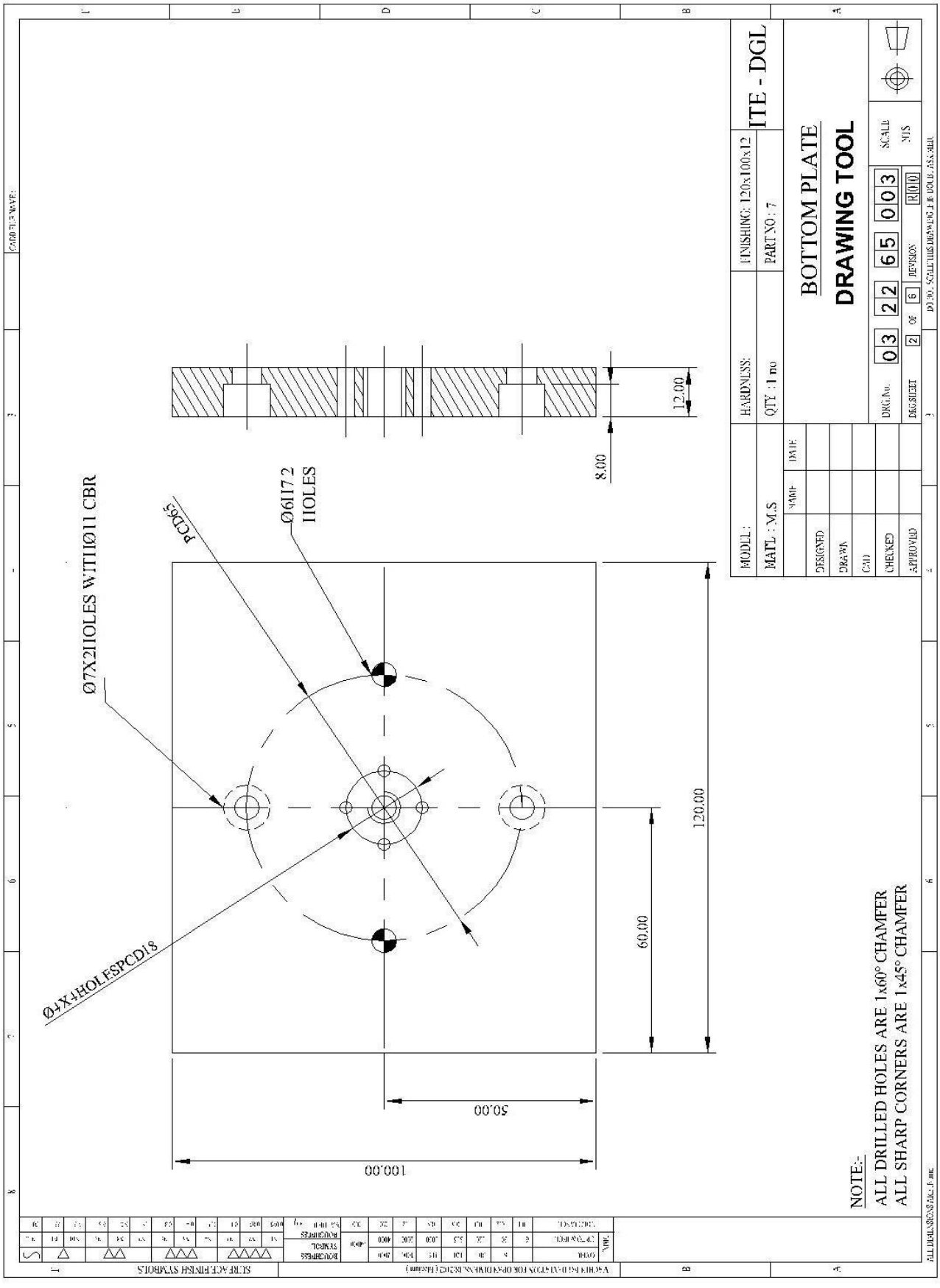
ASSEMBLY

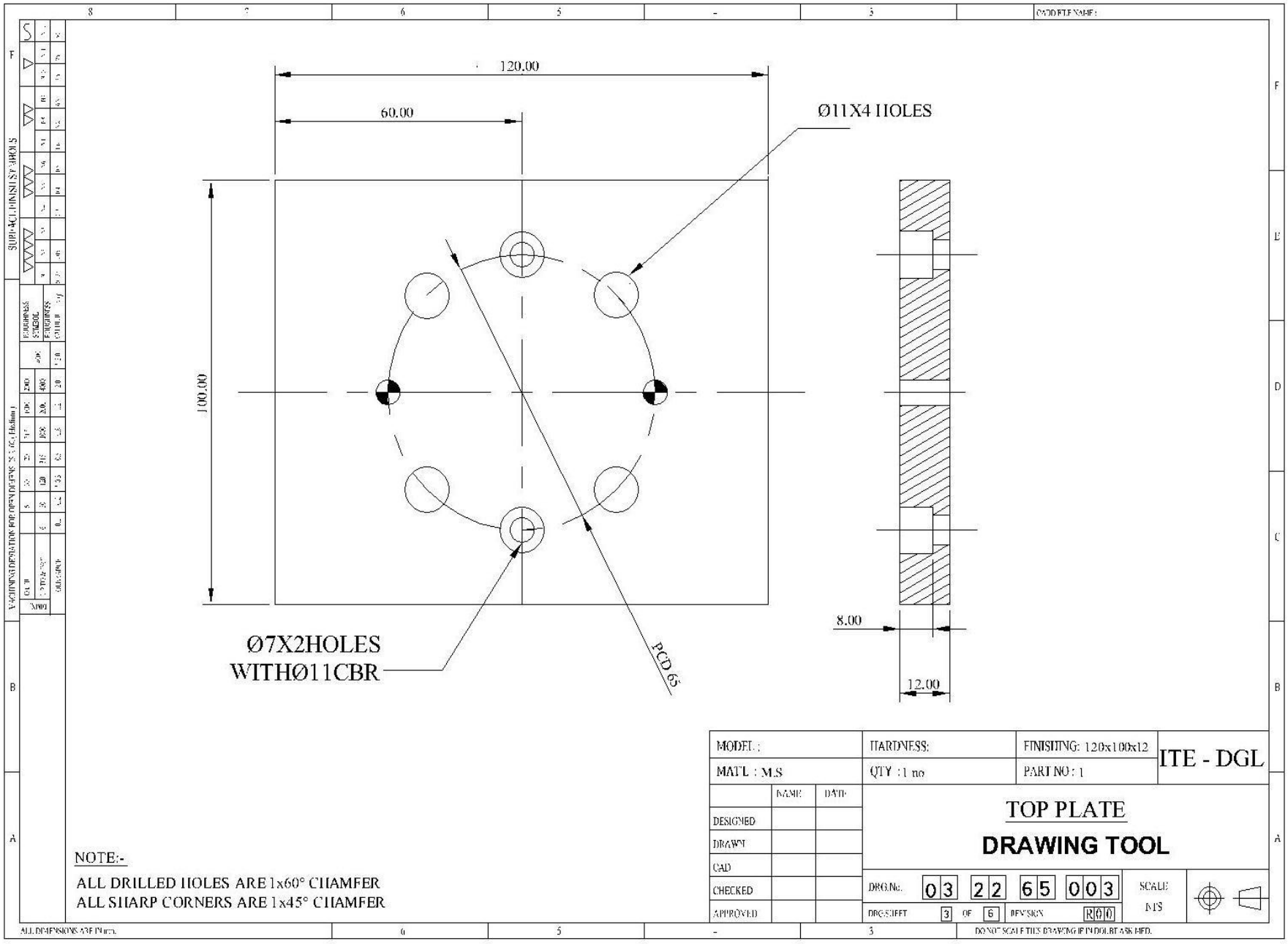
EDGE BENDING

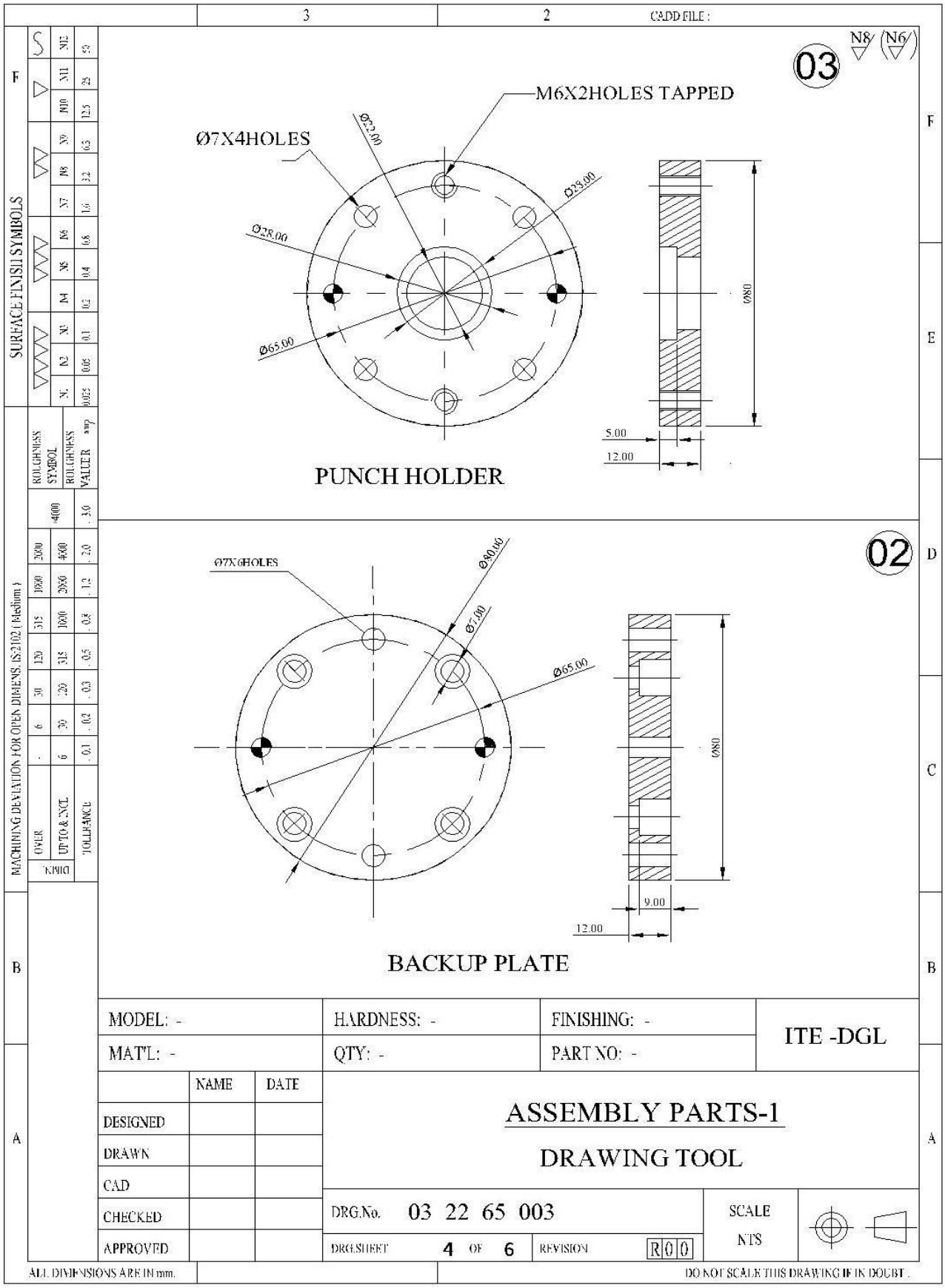
DRG.No. 03 22 65 002 | SCALE NTS | DRG.SHT 5 OF 5 | REVISION R00

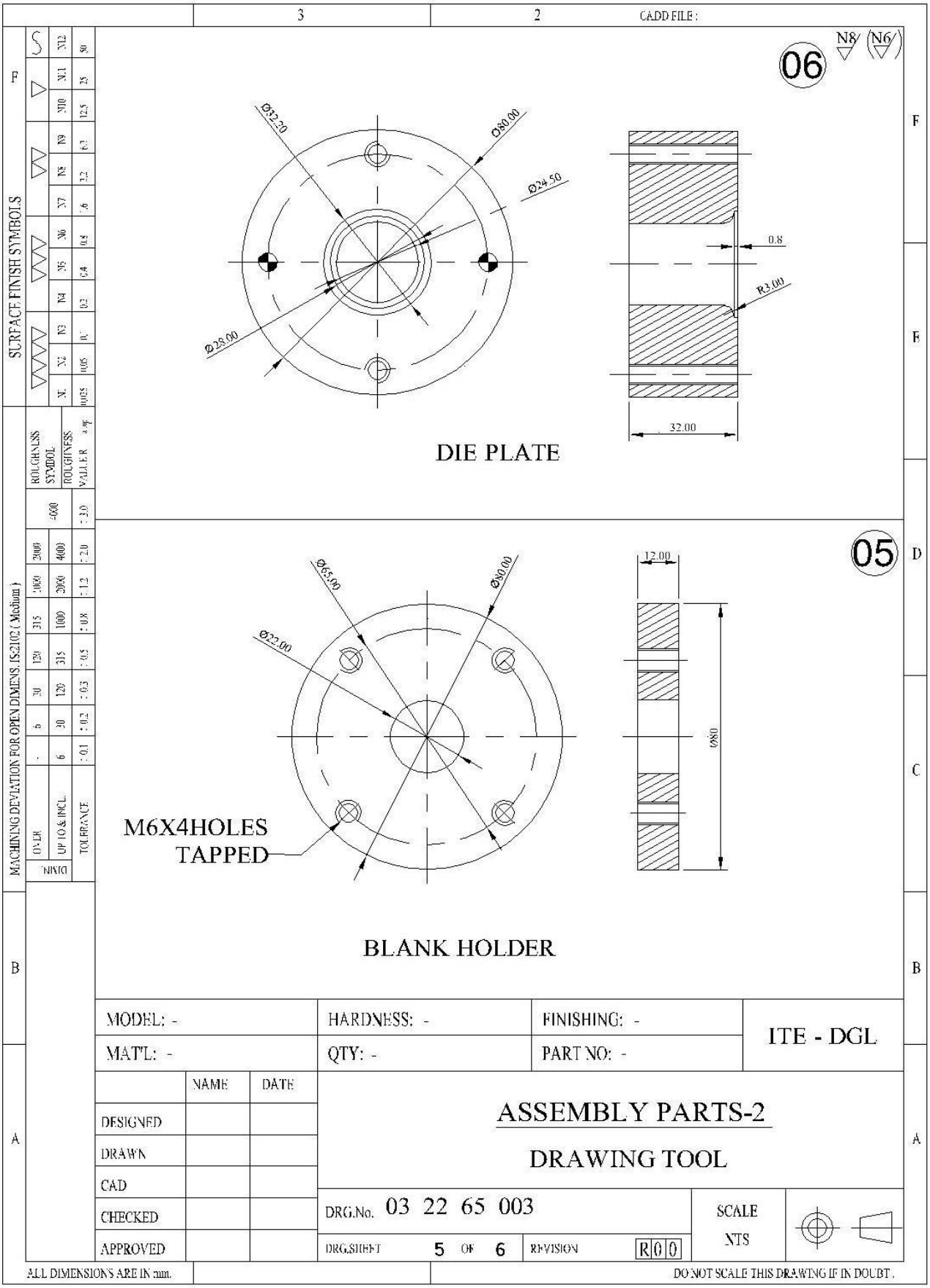
Exercise – III Drawing Tool

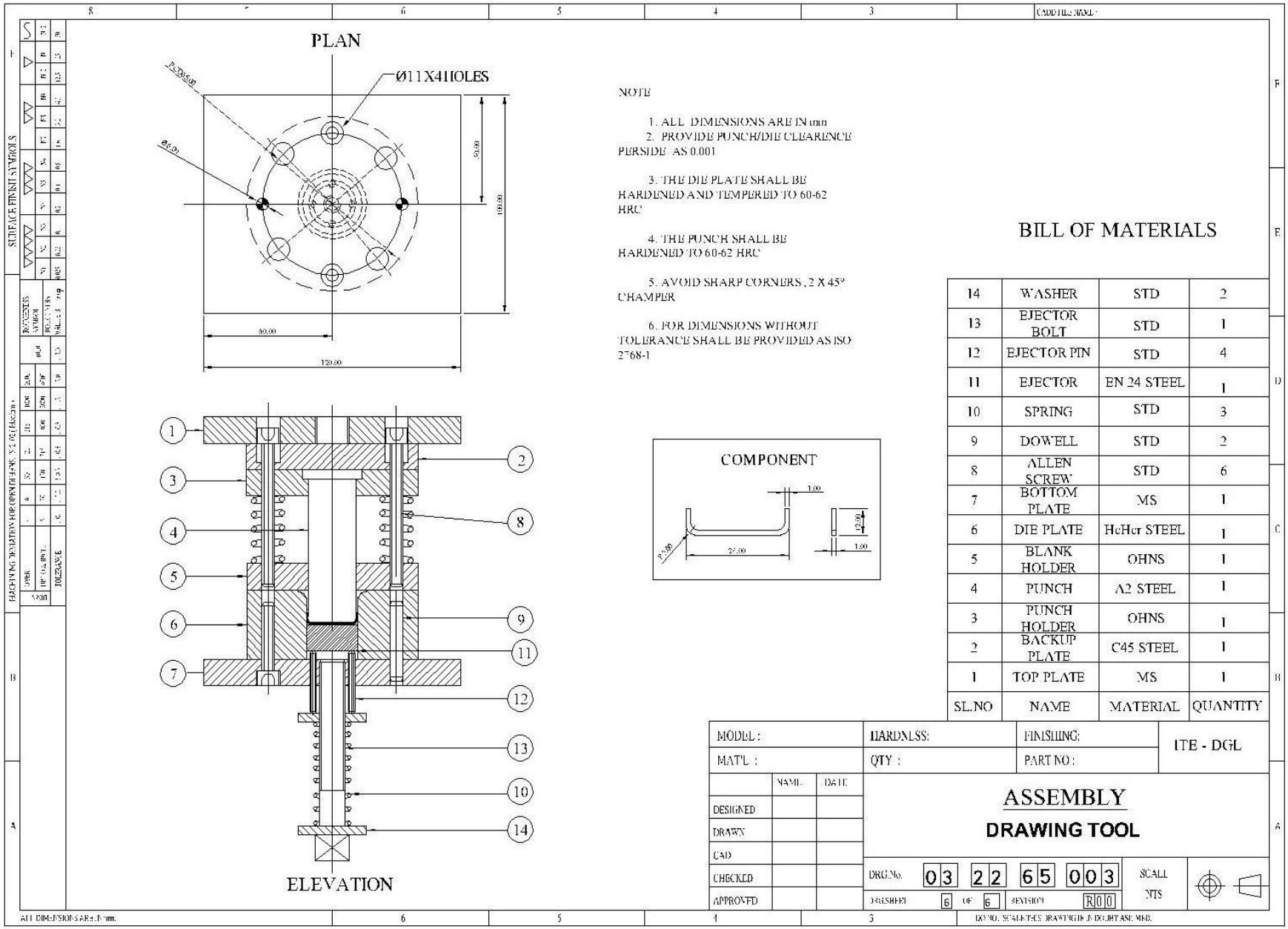



Ø7X2IIOLES WITIIØ11 CBR
PCD65
Ø6II72
IIOLES
Ø4X4HOLESPCD18
12.00
8.00
120.00
60.00
50.00
100.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 120x100x12
PART NO : 7
ITE - DGL
BOTTOM PLATE
DRAWING TOOL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DRG.No. 03 22 65 003
DRG.SHEET 2 OF 6
SCALE NTS

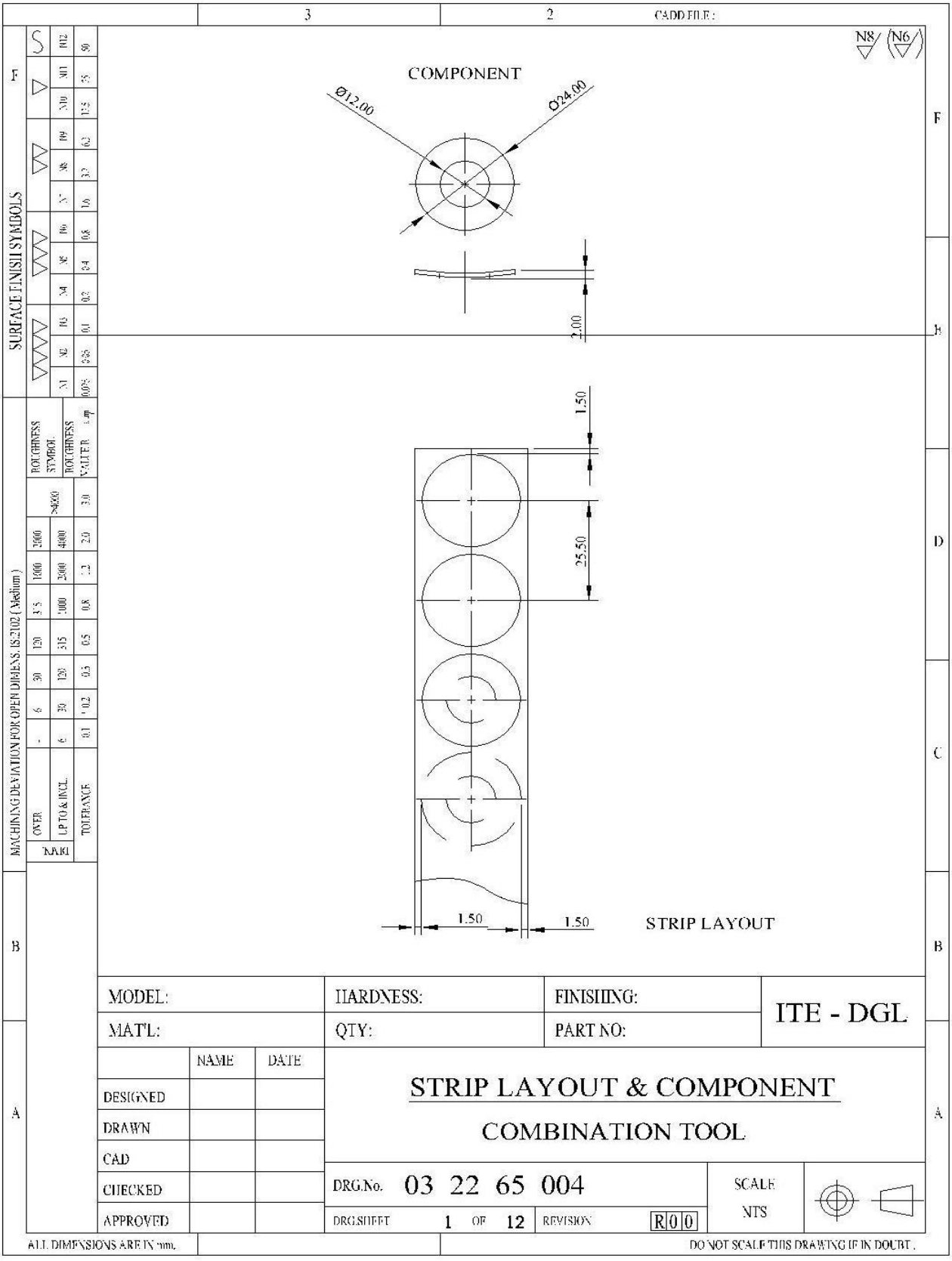

120.00
60.00
Ø11X4 HOLES
100.00
Ø7X2HOLES
WITHØ11CBR
PCD 65
8.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 120x100x12
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : 1
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP PLATE
DRAWING TOOL
DRG.No. 03 22 65 003
SCALE
M/S
DRG SHEET 3 OF 6
REVISION R00

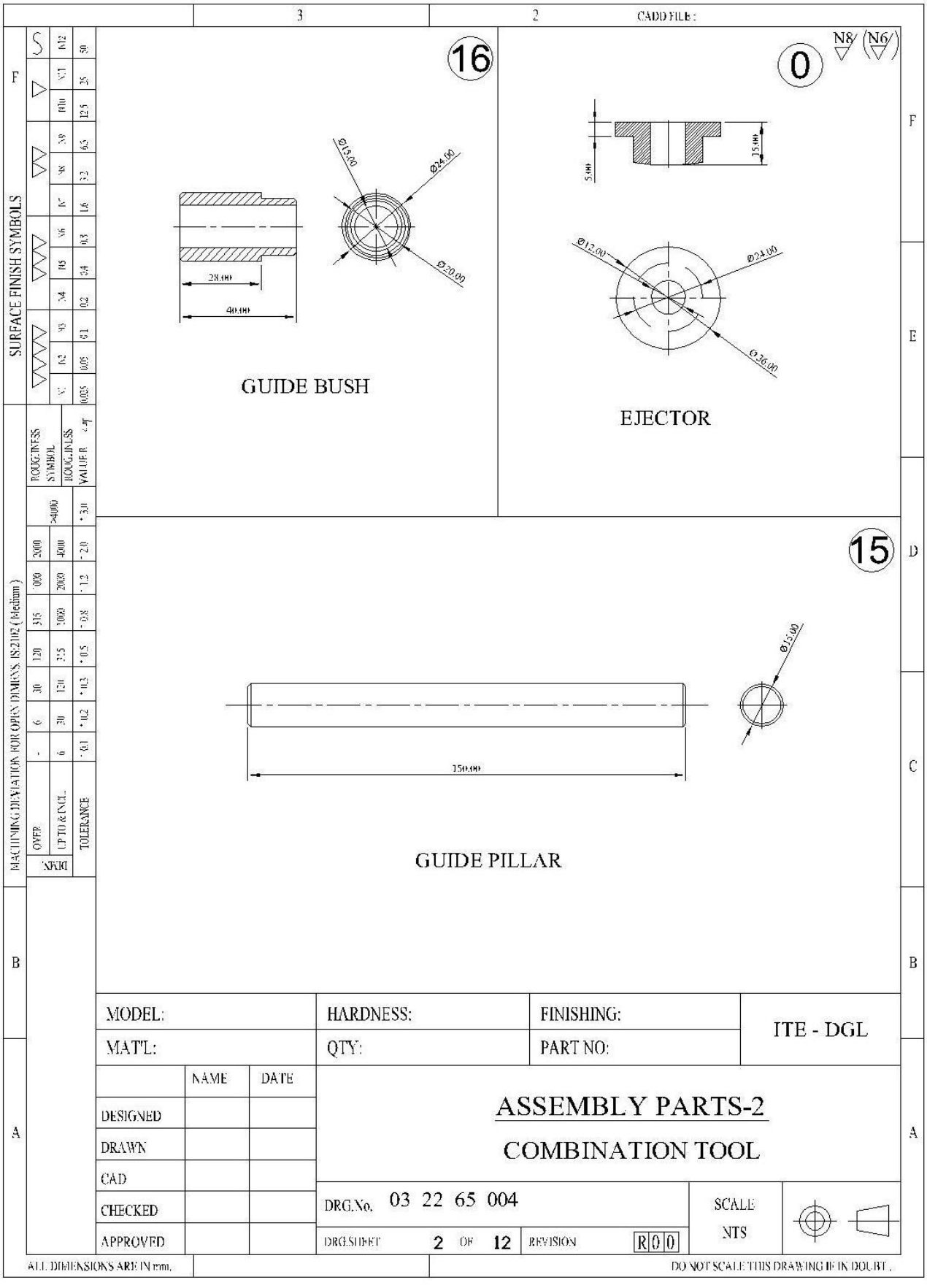

CADD FILE :
03
N8 (N6)
M6X2HOLES TAPPED
Ø7X4HOLES
Ø22.00
Ø28.00
Ø25.00
Ø65.00
Ø80
5.00
12.00
PUNCH HOLDER
02
Ø7X6HOLES
Ø80.00
Ø7.00
Ø65.00
Ø80
9.00
12.00
BACKUP PLATE
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
ITE -DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
DRAWING TOOL
DRG.No. 03 22 65 003
DRG.SHEET 4 OF 6
REVISION R 0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

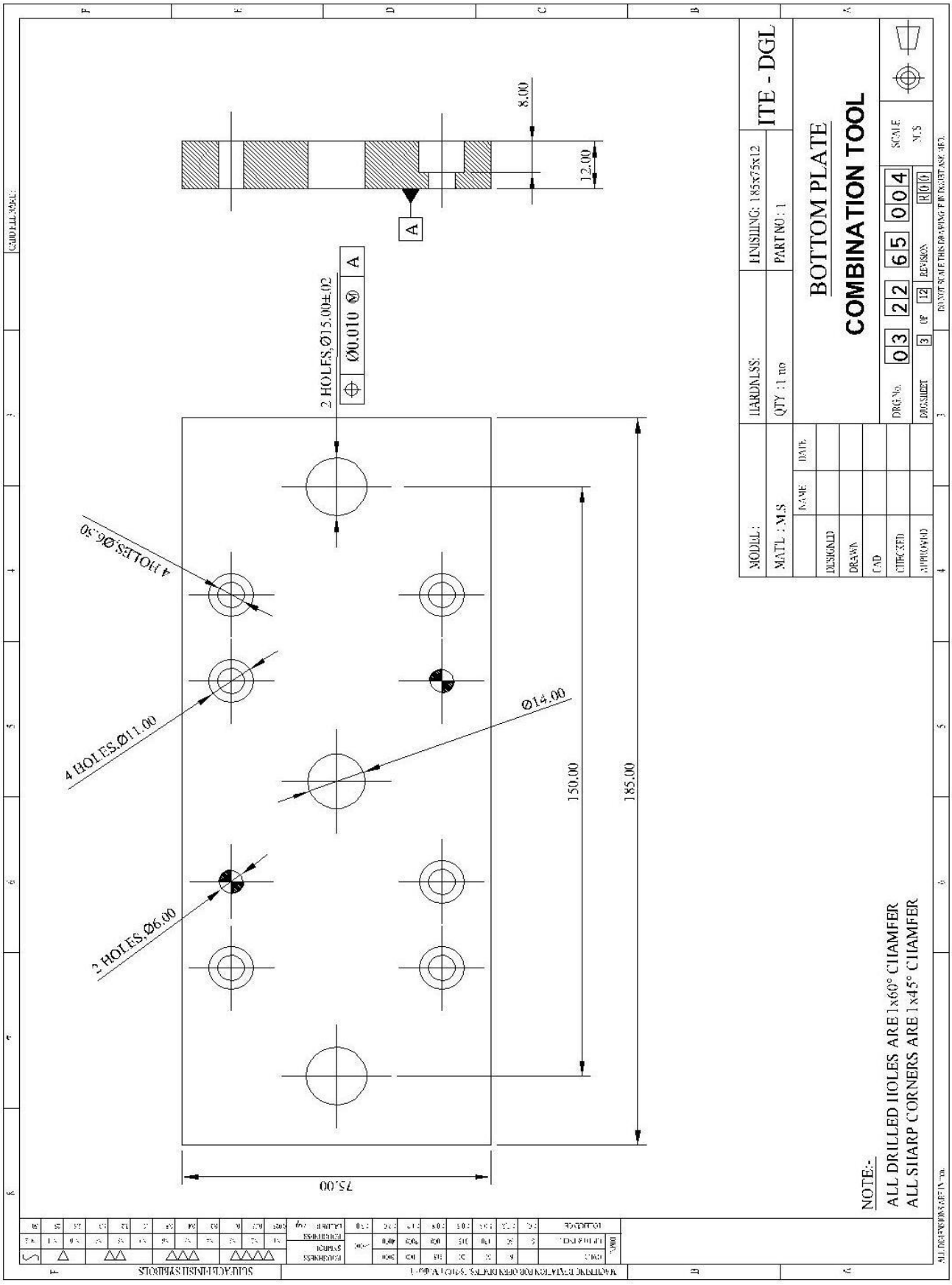

CADD FILE :
06
N8 (N6)
Ø32.20
Ø80.00
Ø24.50
Ø28.00
0.8
R3.00
32.00
DIE PLATE
05
Ø65.00
Ø80.00
Ø22.00
12.00
Ø80
M6X4HOLES
TAPPED
BLANK HOLDER
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS2102 (Medium)
MODEL: -
HARDNESS: -
FINISHING: -
ITE - DGL
MAT'L: -
QTY: -
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-2
DRAWING TOOL
DRG.No. 03 22 65 003
SCALE NTS
DRG.SHEET 5 OF 6
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

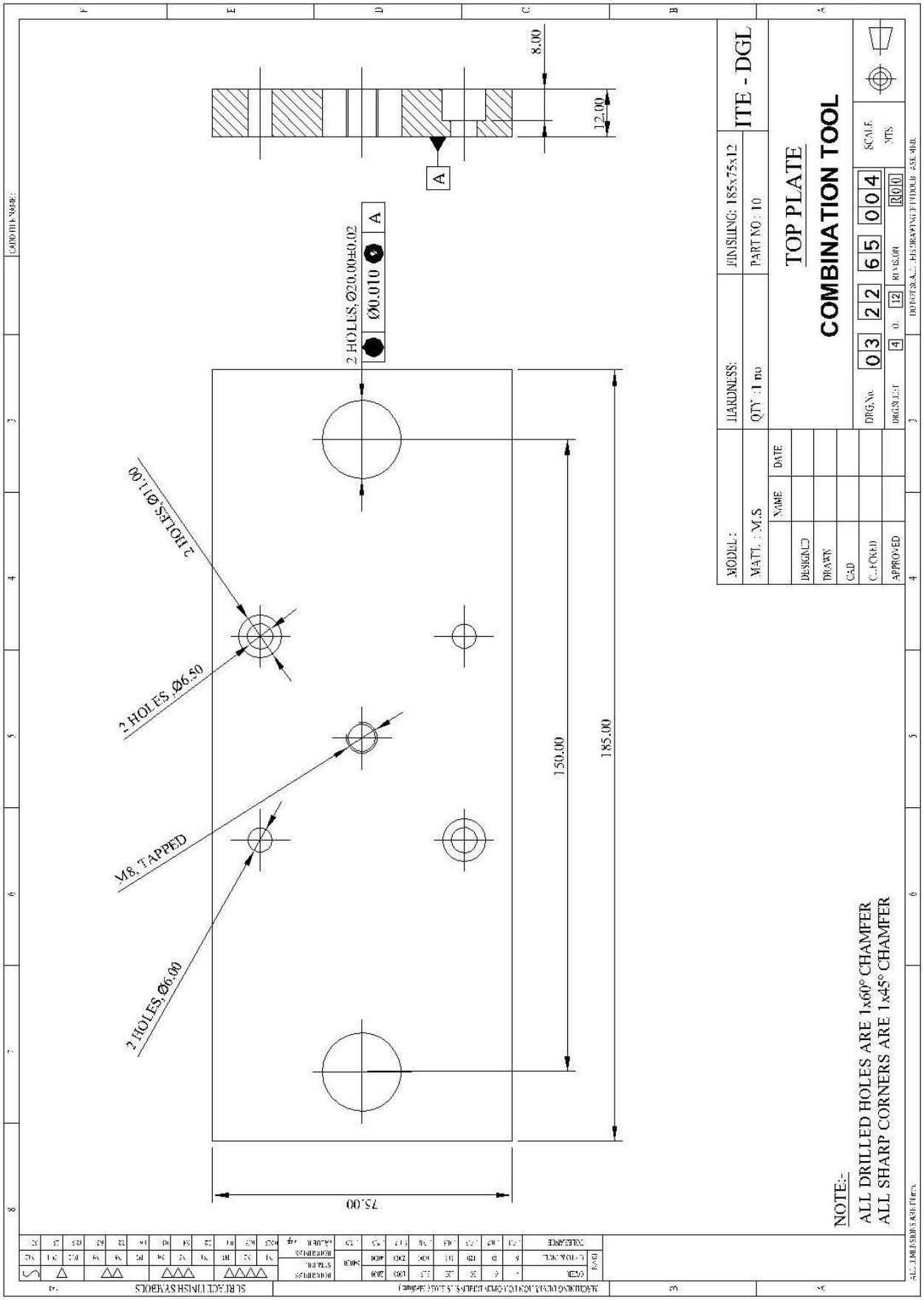

PLAN
Ø11 X4 HOLES
ELEVATION
NOTE
1. ALL DIMENSIONS ARE IN mm
2. PROVIDE PUNCH/DIE CLEARENCE PERSIDE AS 0.001
3. THE DIE PLATE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC
4. THE PUNCH SHALL BE HARDENED TO 60-62 HRC
5. AVOID SHARP CORNERS , 2 X 45° CHAMPER
6. FOR DIMENSIONS WITHOUT TOLERANCE SHALL BE PROVIDED AS ISO 2768-1
COMPONENT
BILL OF MATERIALS
SL.NO | NAME | MATERIAL | QUANTITY
14 | WASHER | STD | 2
13 | EJECTOR BOLT | STD | 1
12 | EJECTOR PIN | STD | 4
11 | EJECTOR | EN 24 STEEL | 1
10 | SPRING | STD | 3
9 | DOWELL | STD | 2
8 | ALLEN SCREW | STD | 6
7 | BOTTOM PLATE | MS | 1
6 | DIE PLATE | HcHcr STEEL | 1
5 | BLANK HOLDER | OHNS | 1
4 | PUNCH | A2 STEEL | 1
3 | PUNCH HOLDER | OHNS | 1
2 | BACKUP PLATE | C45 STEEL | 1
1 | TOP PLATE | MS | 1
MODEL :
MAT'L :
HARDNESS:
QTY :
FINISHING:
PART NO :
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY
DRAWING TOOL
DRG.No. 03 22 65 003
SCALL NTS
DRG.SHEET 6 OF 6
REVISION R00

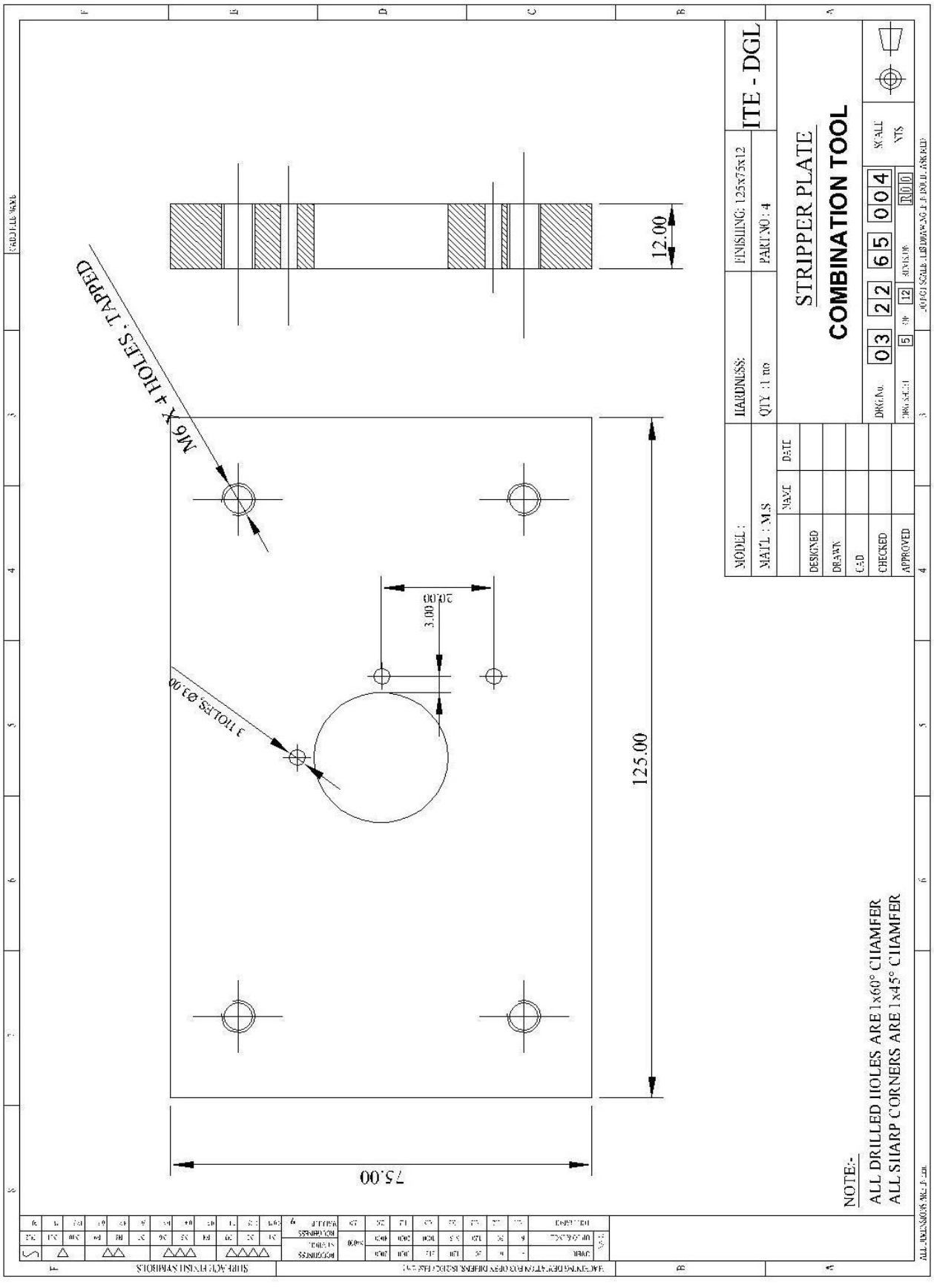
Exercise – IV Combination Tool

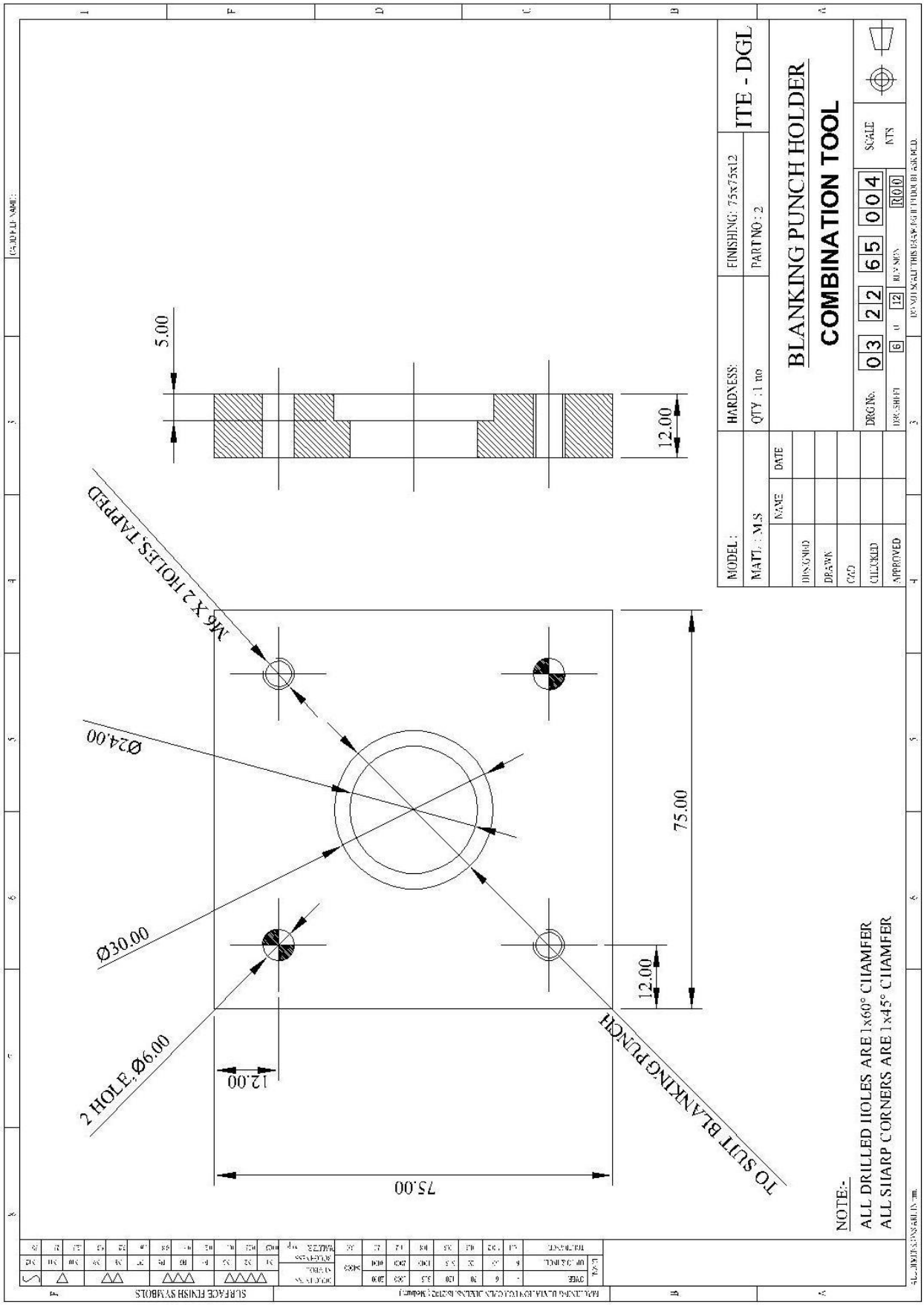



SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
TOLERANCE
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.
CADD FILE :
16
GUIDE BUSH
28.00
40.00
Ø15.00
Ø24.00
Ø20.00
0
EJECTOR
5.00
15.00
Ø12.00
Ø24.00
Ø36.00
15
GUIDE PILLAR
150.00
Ø15.00
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MATL:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-2
COMBINATION TOOL
DRG.No. 03 22 65 004
DRG.SHEET 2 OF 12
REVISION R0 0
SCALE NTS

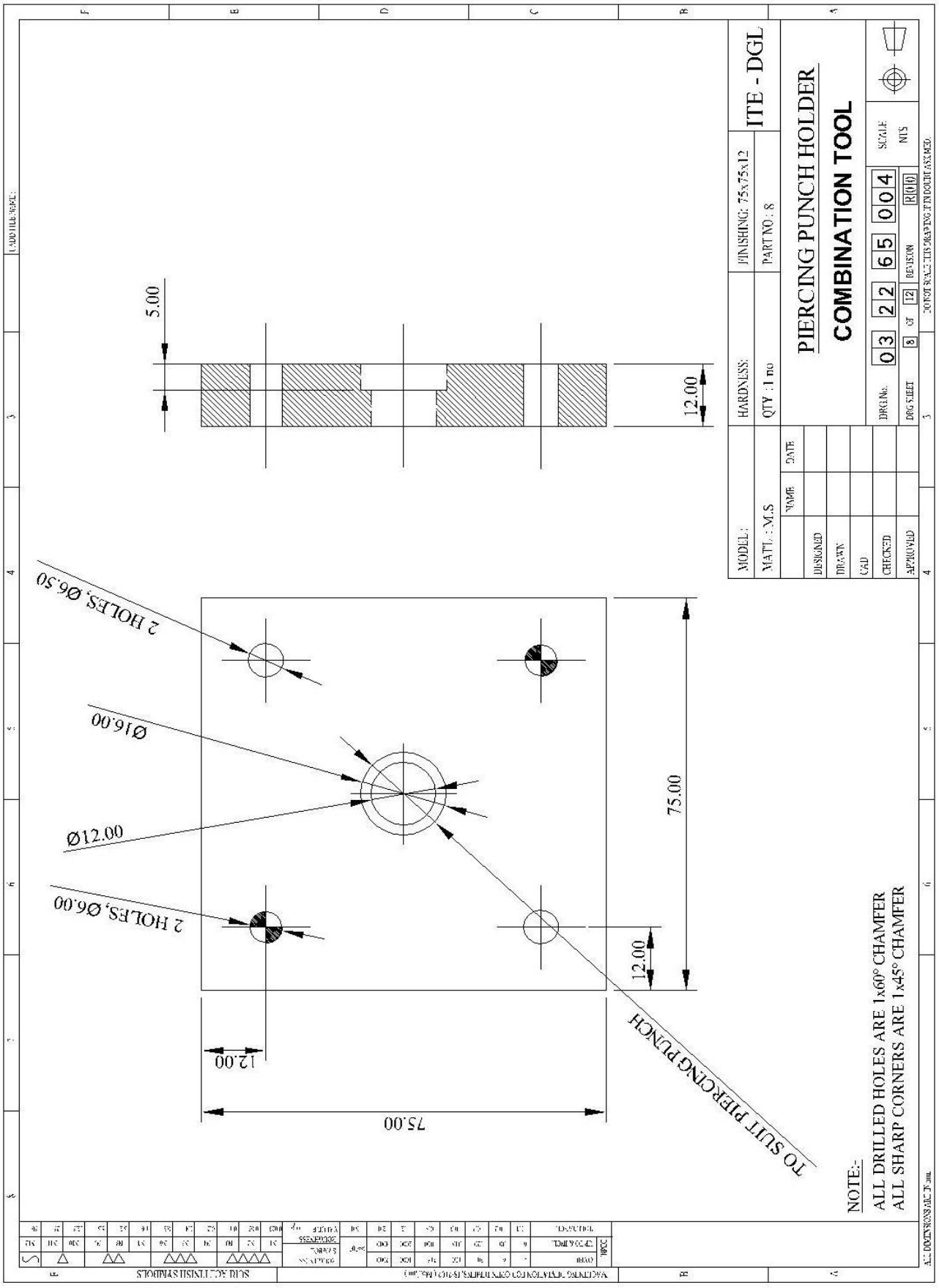

8.00
12.00
A
2 HOLES,Ø15.00±.02
Ø0.010 Ⓜ A
4 HOLES,Ø6.50
4 HOLES,Ø11.00
Ø14.00
2 HOLES,Ø6.00
150.00
185.00
75.00
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
HINGLING: 185x75x12
PART NO : 1
ITE - DGL
BOTTOM PLATE
COMBINATION TOOL
DRG No. 03 22 65 004
SCALE 1:1
DRG SHEET 3 OF 12 REVISION R000
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

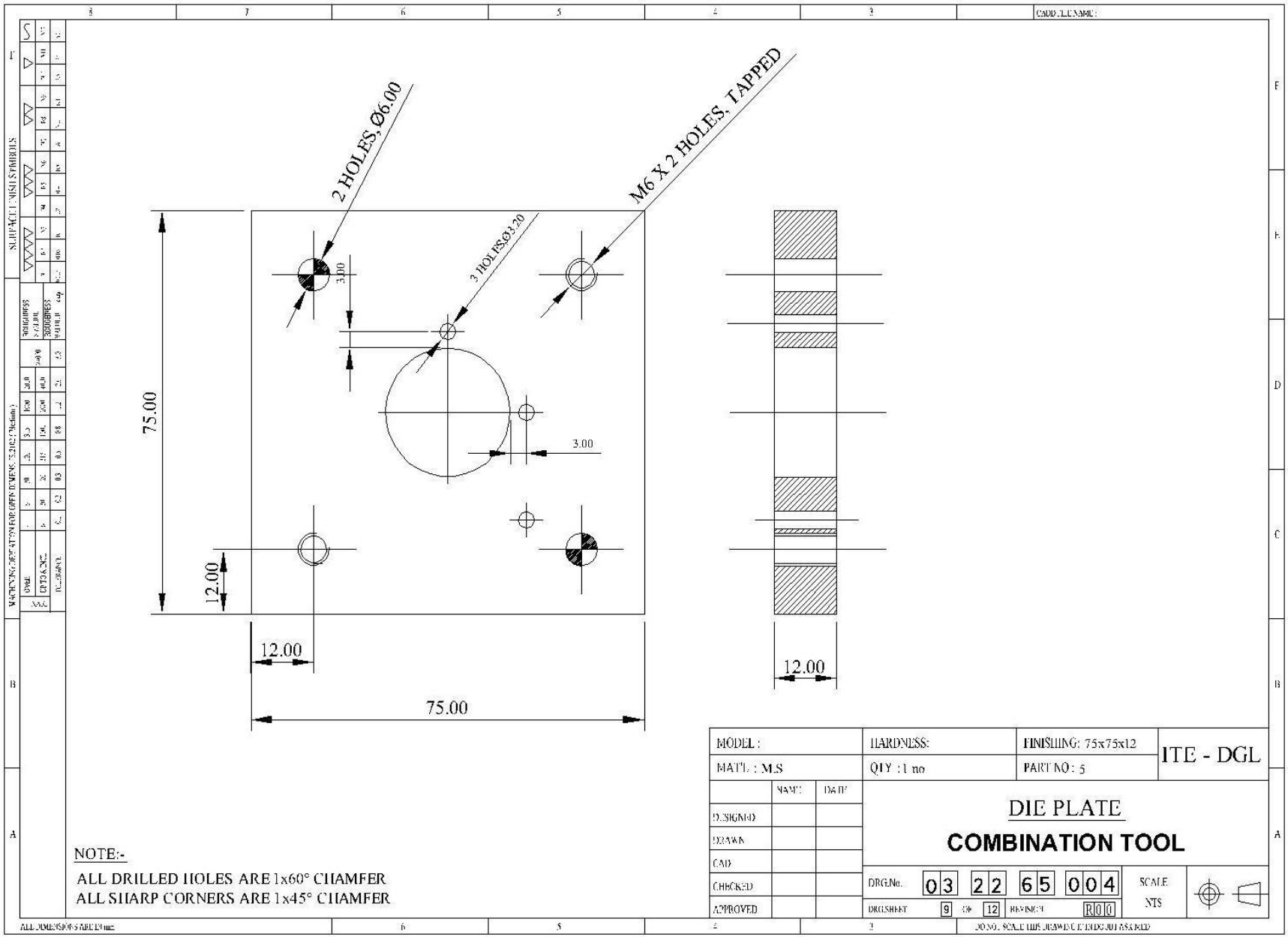

8.00
12.00
A
2 HOLES, Ø20.00±0.02
Ø0.010 A
2 HOLES, Ø11.00
2 HOLES, Ø6.50
M8, TAPPED
2 HOLES, Ø6.00
150.00
185.00
75.00
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 185x75x12
PART NO : 10
ITE - DGL
TOP PLATE
COMBINATION TOOL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DRG.No. 03 22 65 004
SCALE
NTS
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

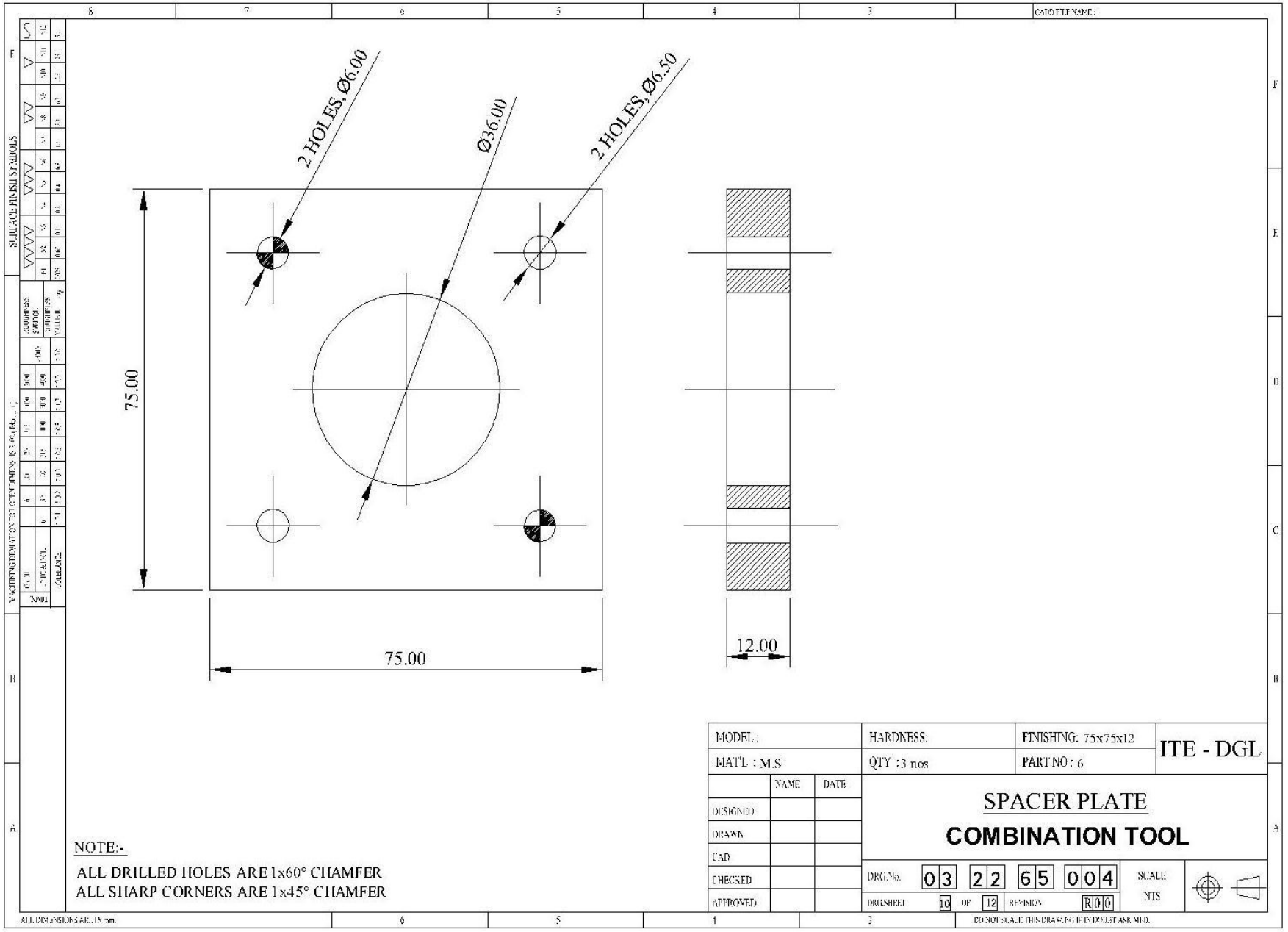

STRIPPER PLATE
COMBINATION TOOL
ITE - DGL
MODEL :
MAT'L : M.S
HARDNESS:
QTY : 1 no
FINISHING: 125x75x12
PART NO : 4
DESIGNED
DRAWN
CHECKED
APPROVED
DWG.No. 03 22 65 004
SCALE VTS
M6 X 4 HOLES ; TAPPED
3 HOLES Ø3.00
20.00
3.00
12.00
125.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


BLANKING PUNCH HOLDER
COMBINATION TOOL
ITE - DGL
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 75x75x12
PART NO : 2
DRG No. 03 22 65 004
SCALE NTS
DRAWN
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DATE
NAME
5.00
12.00
M6 X 2 HOLES TAPPED
Ø24.00
Ø30.00
2 HOLE Ø6.00
12.00
75.00
12.00
75.00
TO SUIT BLANKING PUNCH
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

6.00
2 HOLES, Ø6.50
2 HOLES, Ø6.00
75.00
12.00
12.00
75.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
BACKUP PLATE
COMBINATION TOOL
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : 9
FINISHING: 75x75x6
DRG.No. 03 22 65 004
SCALE: NTS


PIERCING PUNCH HOLDER
COMBINATION TOOL
ITE - DGL
MODEL :
MATL : M.S
HARDNESS:
QTY : 1 no
FINISHING: 75x75x12
PART NO : 8
DRG No. 03 22 65 004
SCALE NTS
DRG SHEET 8 OF 12 REVISION R(0)
DESIGNED
DRAWN
CHECKED
APPROVED
NAME
DATE
5.00
12.00
2 HOLES, Ø6.50
Ø16.00
Ø12.00
2 HOLES, Ø6.00
75.00
12.00
12.00
75.00
TO SUIT PIERCING PUNCH
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER


2 HOLES, Ø6.00
M6 X 2 HOLES, TAPPED
3 HOLES Ø3.20
3.00
3.00
75.00
12.00
12.00
75.00
12.00
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL :
HARDNESS:
FINISHING: 75x75x12
ITE - DGL
MATL : M.S
QTY : 1 no
PART NO : 5
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DIE PLATE
COMBINATION TOOL
DRG.No. 03 22 65 004
SCALE
NTS
DRG.SHEET 9 OF 12
REVISION R00



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL :	HARDNESS:	FINISHING: 75x75x12
MAT'L : M.S	QTY :3 nos	PART NO : 6

ITE - DGL

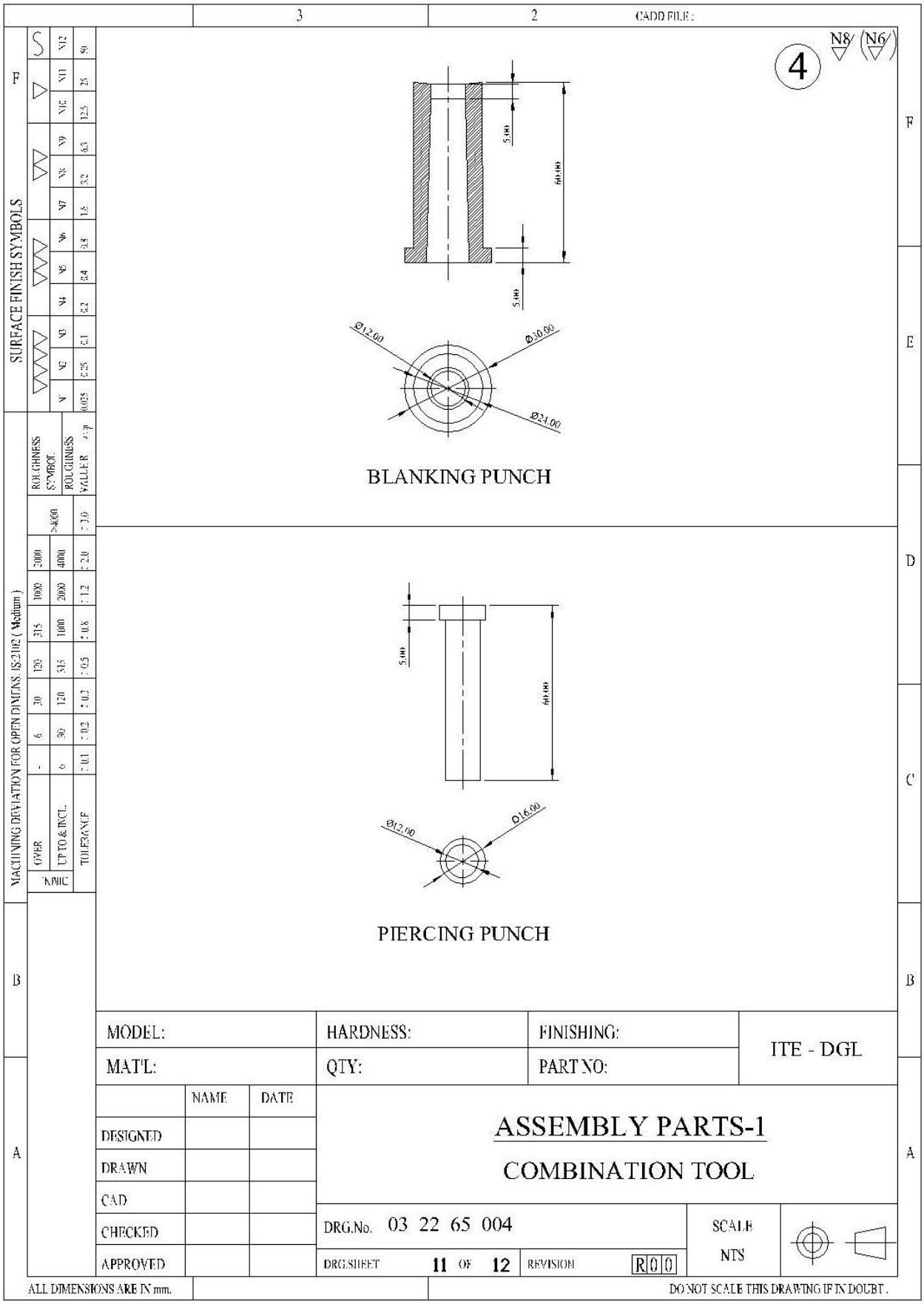
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

SPACER PLATE

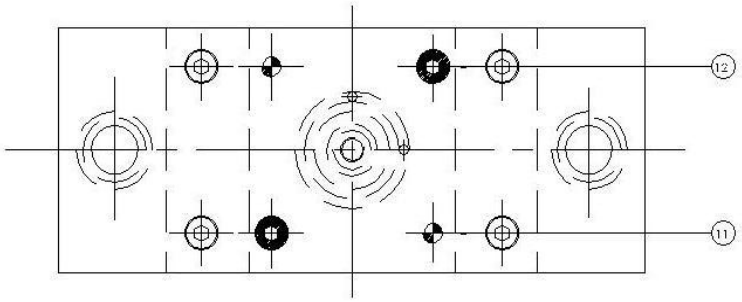
COMBINATION TOOL

DRG.No. 03 22 65 004 SCALE NTS

DRG.SHEET 10 OF 12 REVISION R00


CADD FILE :
4
N8 (N6)
5 MM
60 MM
5 MM
Ø12.00
Ø30.00
Ø24.00
BLANKING PUNCH
5 MM
60 MM
Ø12.00
Ø16.00
PIERCING PUNCH
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
TOLERANCE
UP TO & INCL.
OVER
MODEL:
HARDNESS:
FINISHING:
MAT'L:
QTY:
PART NO:
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLY PARTS-1
COMBINATION TOOL
DRG.No. 03 22 65 004
DRG.SHEET 11 OF 12
REVISION R 0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.

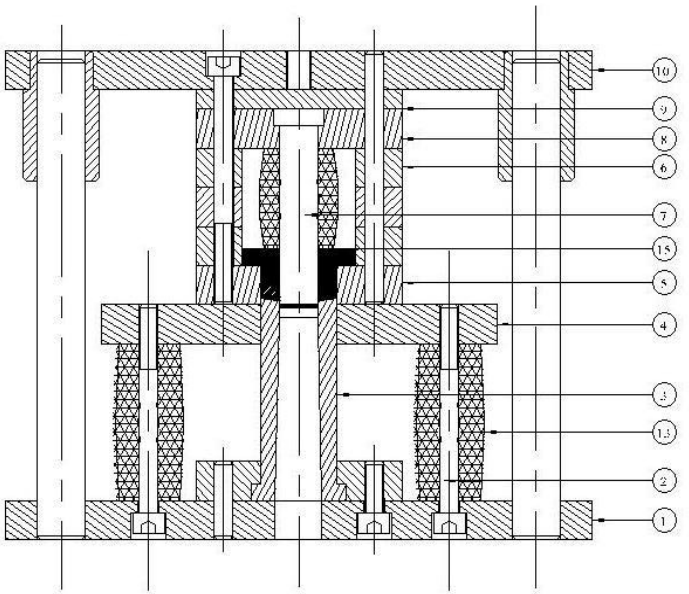
PLAN



NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. THE PUNCH SHALL BE HARDENED AND TEMPERED TO 60-62 HRC.
3. THE DIE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC.
4. PROVIDE PUNCH AND DIE CLEARANCE PER SIDE 0.01 mm
5. AVOID SHARP CORNERS, 2 X 45° CHAMFER
6. FOR DIMENSIONS WITHOUT TOLERANCE, TOLERANCE SHALL BE GIVEN AS PER ISO-2678

BILL OF MATERIALS

S.NO	NAME	MATERIAL	QUANTITY
16	SUPPORT BUSH	MS	2
15	SUPPORT PILLAR	MS	2
14	STOP PIN	STD	2
13	POLY URETHANE RUBBER	PU	5
12	ALAN SCREW	STD	8
11	DOWEL	STD	4
10	TOP PLATE	MS	1
9	BACKUP PLATE	MS	1
8	PIERCING PUNCH HOLDER	MS	1
7	PIERCING PUNCH	MS	1
6	SPACER PLATE	MS	3
5	DIE PLATE	MS	1
4	STRIPPER PLATE	MS	1
3	BLANKING PUNCH	MS	1
2	BLANKING PUNCH HOLDER	MS	1
1	BOTTOM PLATE	MS	1



SECTIONAL ELEVATION

MODEL :	HARDNESS:	FINISHING:
MATL :	QTY :	PART NO :

ITE - DGL

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY

COMBINATION TOOL

DRG.No. 03 22 65 004

DRG.SHEET 12 OF 12 REVISION R00

SCALE NTS

ALL DIMENSIONS ARE IN mm. DO NOT SCALE THIS DRAWING IF PRINTING IS NOT ASKED.

DIRECTORATE OF TECHNICAL EDUCATION

DETAILS OF THE EQUIPMENTS

NAME OF THE BRANCH / COURSE	MECHANICAL ENGINEERING (TOOL & DIE)
YEAR	THIRD
SEMESTER	VI
NAME OF THE LABORATORY	32265 PRESS TOOLS - II PRACTICAL

S.NO	LIST OF THE EQUIPMENTS WITH SPECIFICATIONS REMARKS, IF ANY	QUANTITY REQUIRED
1	Centre Lathe, 4 ½' bed length	5
2	Drilling machine	2
3	Shaping machine, stroke length 300mm	2
4	Vertical milling machine	2
5	Surface grinding machine	2
6	Bench vice	10
7	Fitting file set	10
8	Tap set	4
9	Surface plate	2
10	Vernier height gauge 0-250mm	2
11	Dial test indicator with magnetic stand	2
12	Angle plate	2
13	Mechanical power press (15tons- 100 tons)	1
14.	Tool maker’s straight edge – 150 mm	1
15	Digital Micrometer – 0.-25mm range, 0.001mm least count	3

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

32266 - PLASTIC MOULDS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)

M-SCHEME

(To be implemented from the student Admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (TOOL & DIE)
Course Code : 1220
Subject Code : 32266
Semester : VI
Subject Title : **PLASTIC MOULDS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 15 weeks

SUBJECT	Instructions		Examination			
			Marks			Duration (Hrs)
	Hours/ Week	Hours/ Semester	Internal Assessment (Marks)	Board Examination (Marks)	Total (Marks)	
Plastic Moulds Practical	**4**	**60**	**25**	**75**	**100**	16

OBJECTIVES

- Design and fabricate single cavity injection mould
- Design and fabricate multi cavity injection mould
- Design and fabricate blow mould.
- Design and fabricate of compression mould
- Practice on different machining operations
- Use different machine tools in making plastic moulds

Detailed Syllabus

i) Design of Plastic Moulds: **(16 Hrs)**

1. Injection Mould Design: Methodical approach to mould design.

- Design of Hand injection mould
- Design of three plate mould

2. Design of simple Compression Mould.

3. Design of simple Blow mould.

ii) Mould Design and Manufacture Exercises: **(44 Hrs)**

1. Design and Fabrication of single cavity hand injection mould with flat parting surface (To suit to Hand Injection Moulding Machine)
2. Design and fabrication of multi cavity injection mould (To suit to Hand injection Moulding Machine)
3. Design and fabrication of simple compression mould.
4. Design and fabrication of simple blow mould.

Note:-

1. Batch size should not be more than 5 students for class work.
2. For examination, exercise should be given to students individually and not in batches.
3. The examination duration is 16 hours.
4. Students should be trained in setting the mould and to make necessary adjustments, trial production using the mould manufactured by them and rectification of mould defects if any.
5. For Board examination any one of the above tool (S.No 1 to 4) is to be manufactured and trial production should be taken. The evaluation of the performance should be based on the component dimensions and finish obtained from the mould manufactured by the student during the 16 hours examination.

Record: Mould drawings for all the exercises should be drawn in A2 sheet Manually, with all calculations filed neatly for Record work. The Design should include the Sectional Elevation, plan view, Bill of materials with all necessary calculation using methodological mould design.

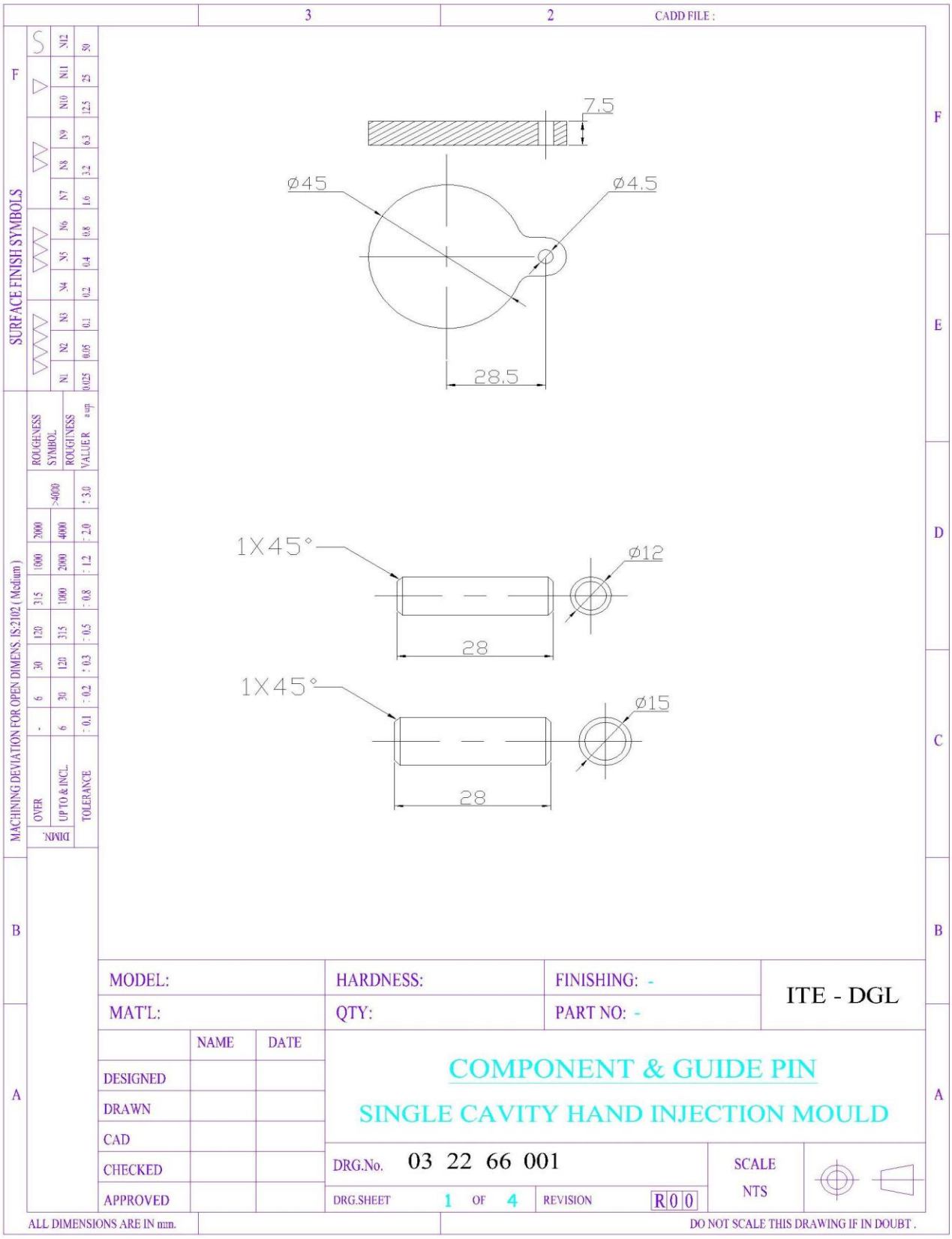
Examination:

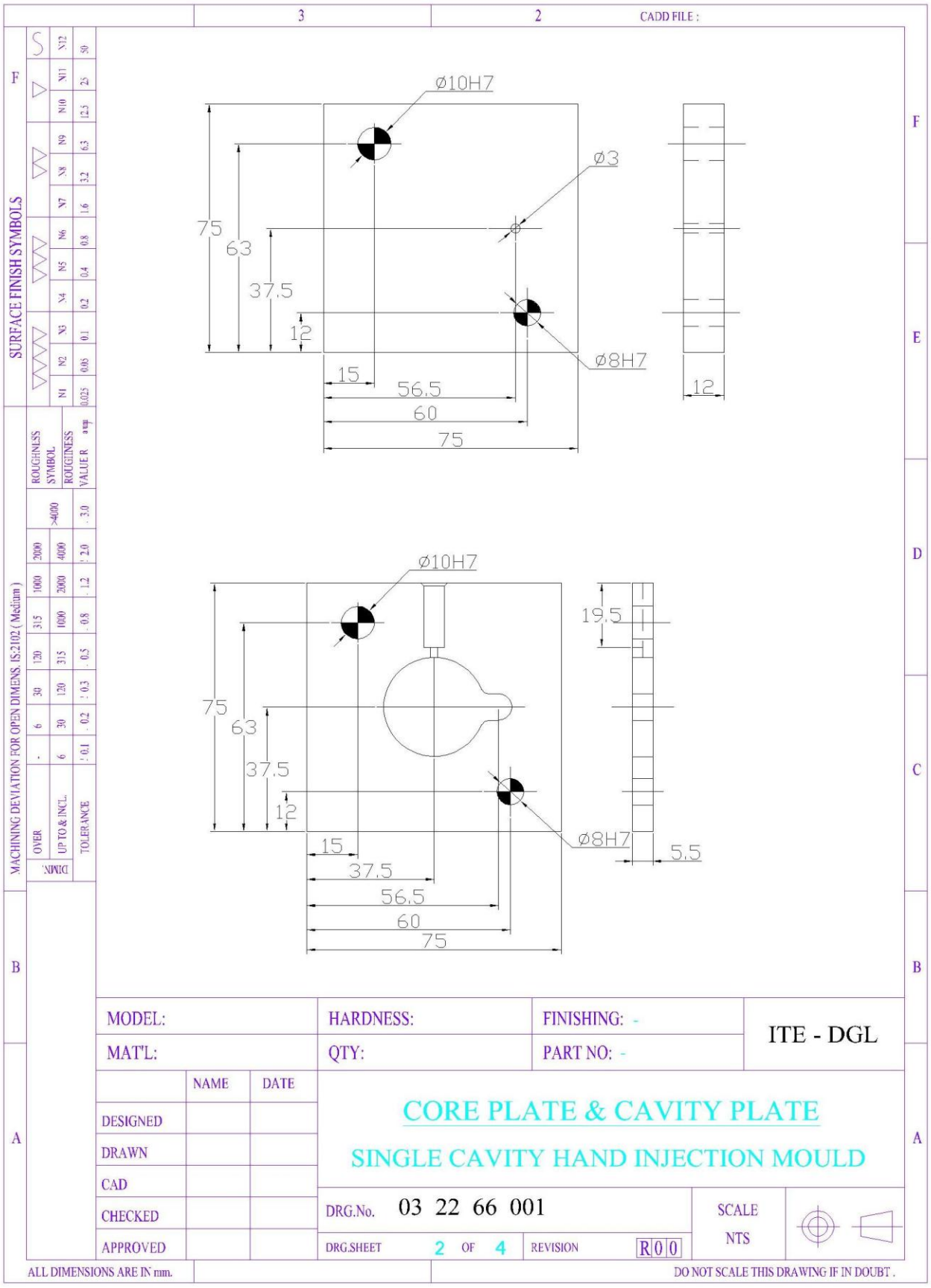
In the examination students have to Design and fabricate moulds for similar components as practiced in the class work

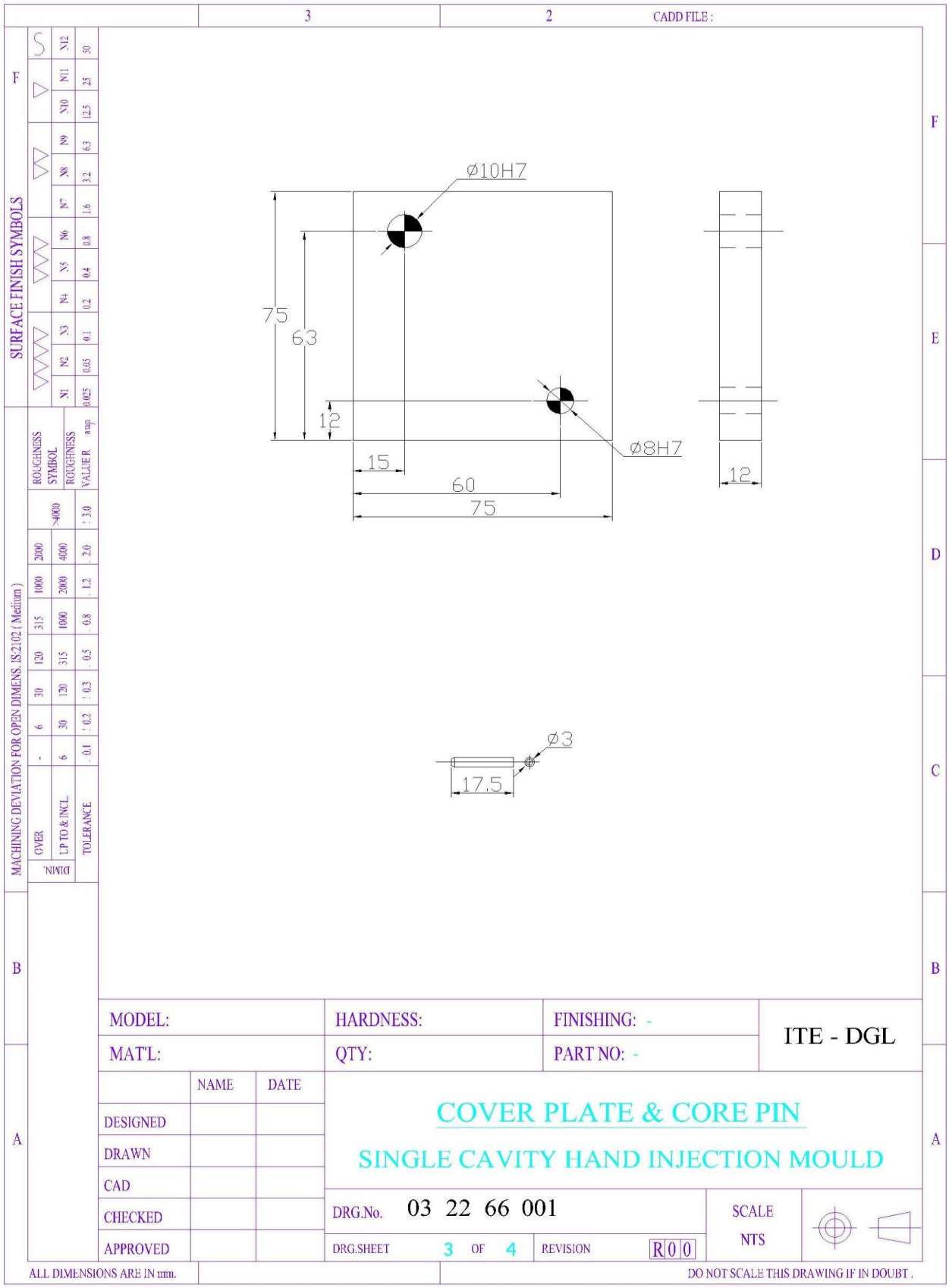
SCHEME OF EXAMINATION:

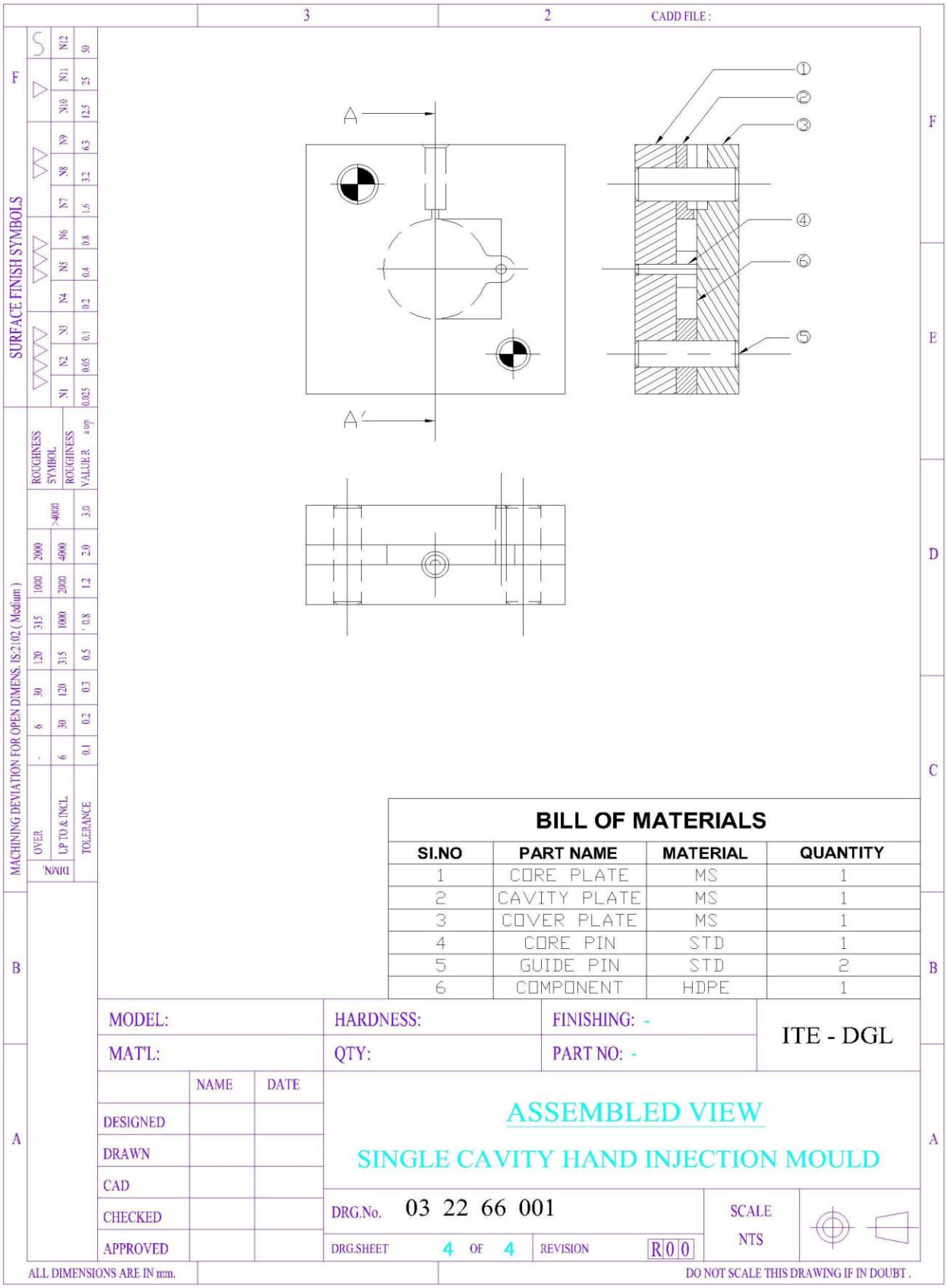
Design of Mould	-20 marks
Mould making	-30 marks
Mould setting & trial production	-10 Marks
Component quality	-10 marks
Viva Voce	-05 Marks
Total	**-75 Marks**

Exercise – I Single Cavity Injection Mould

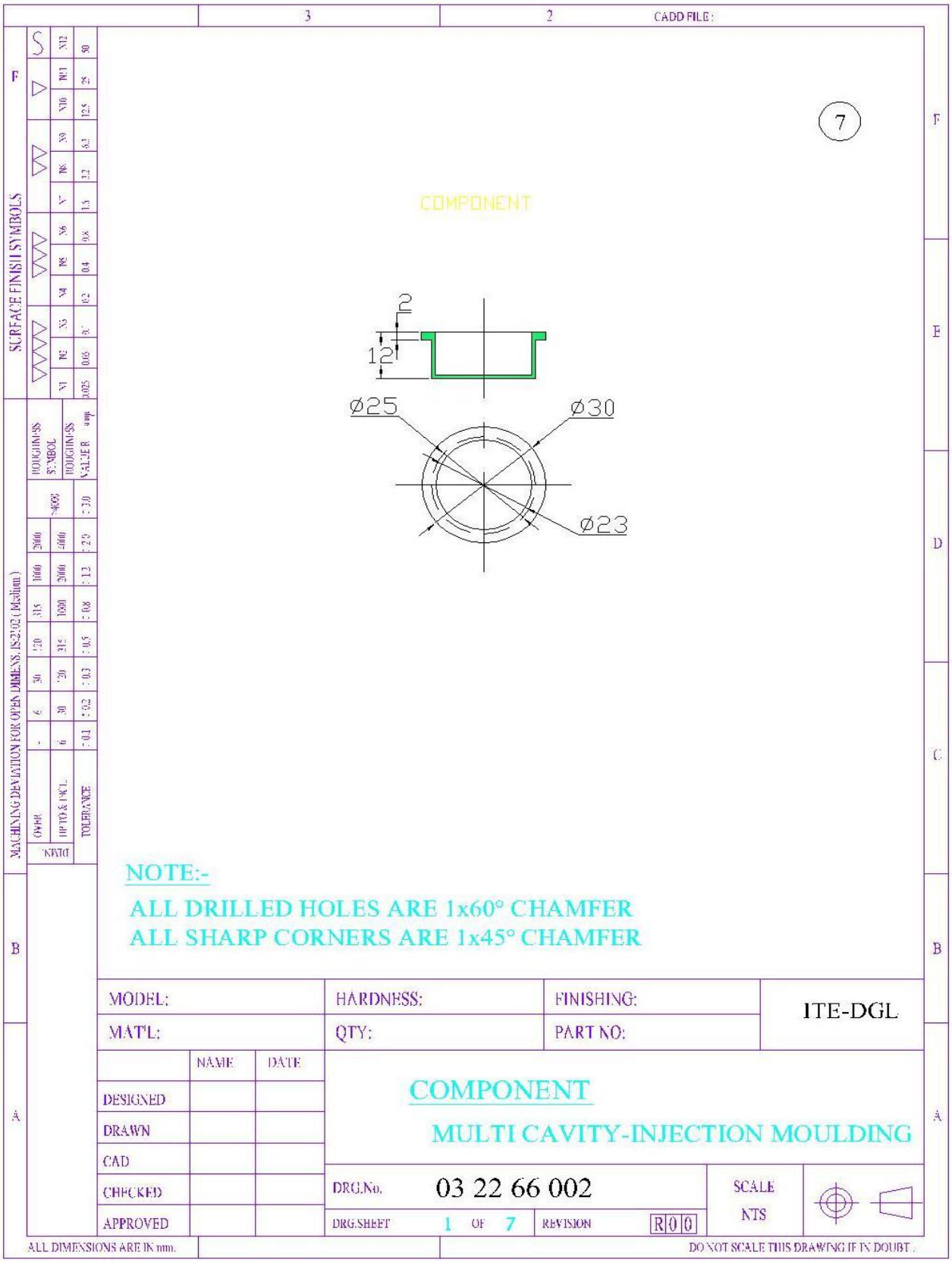


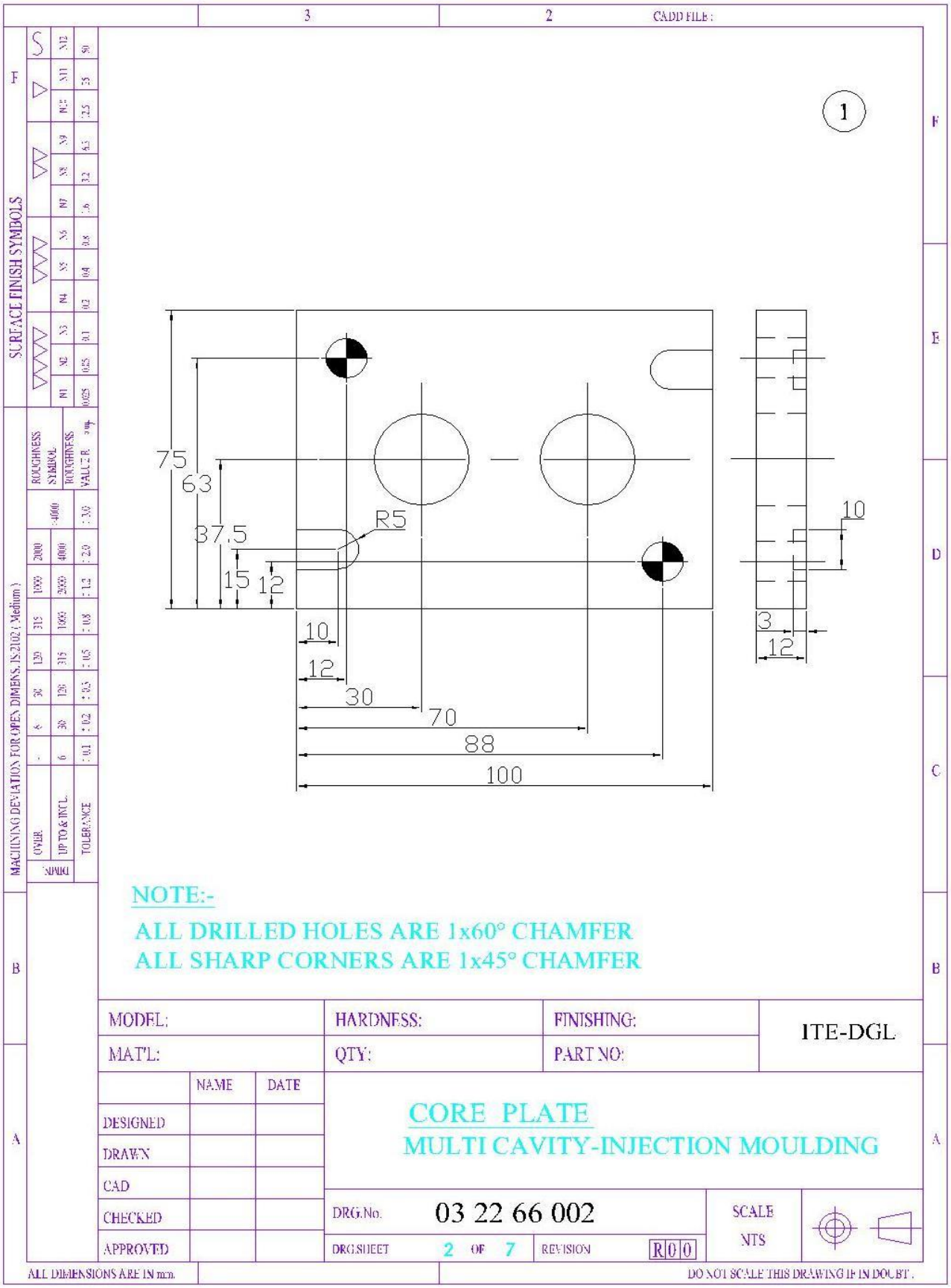

3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
Ø10H7
Ø3
Ø8H7
75
63
37.5
12
15
56.5
60
75
12
19.5
5.5
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
CORE PLATE & CAVITY PLATE
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
SCALE NTS
DRG.SHEET 2 OF 4
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

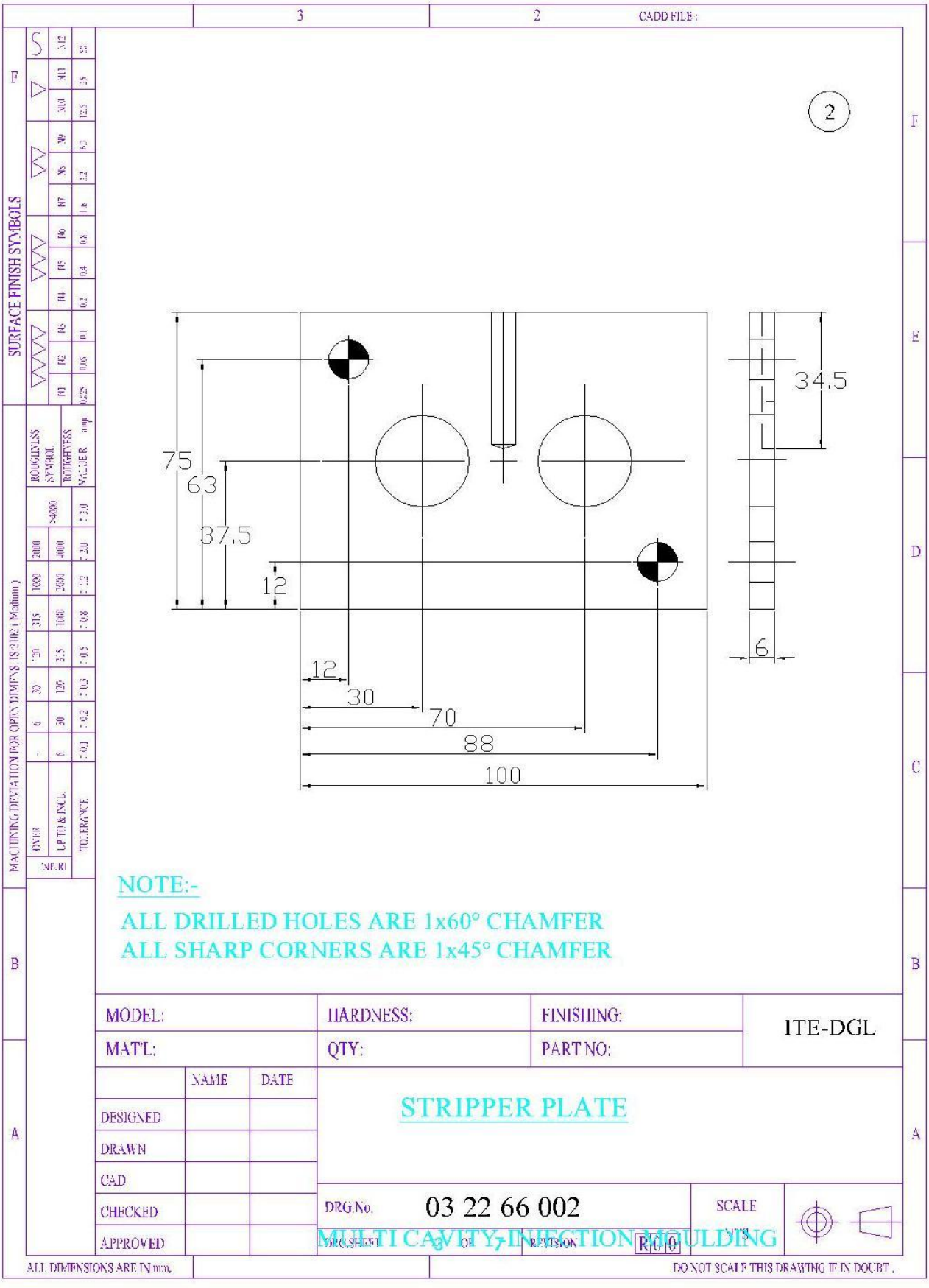

3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a µm
ø10H7
ø8H7
75
63
12
15
60
75
12
ø3
17.5
MODEL:
HARDNESS:
FINISHING: -
MAT'L:
QTY:
PART NO: -
ITE - DGL
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
COVER PLATE & CORE PIN
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
DRG.SHEET 3 OF 4
REVISION R 0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a μm
A
A'
①
②
③
④
⑥
⑤
BILL OF MATERIALS
SI.NO | PART NAME | MATERIAL | QUANTITY
1 | CORE PLATE | MS | 1
2 | CAVITY PLATE | MS | 1
3 | COVER PLATE | MS | 1
4 | CORE PIN | STD | 1
5 | GUIDE PIN | STD | 2
6 | COMPONENT | HDPE | 1
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLED VIEW
SINGLE CAVITY HAND INJECTION MOULD
DRG.No. 03 22 66 001
SCALE NTS
DRG.SHEET 4 OF 4
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

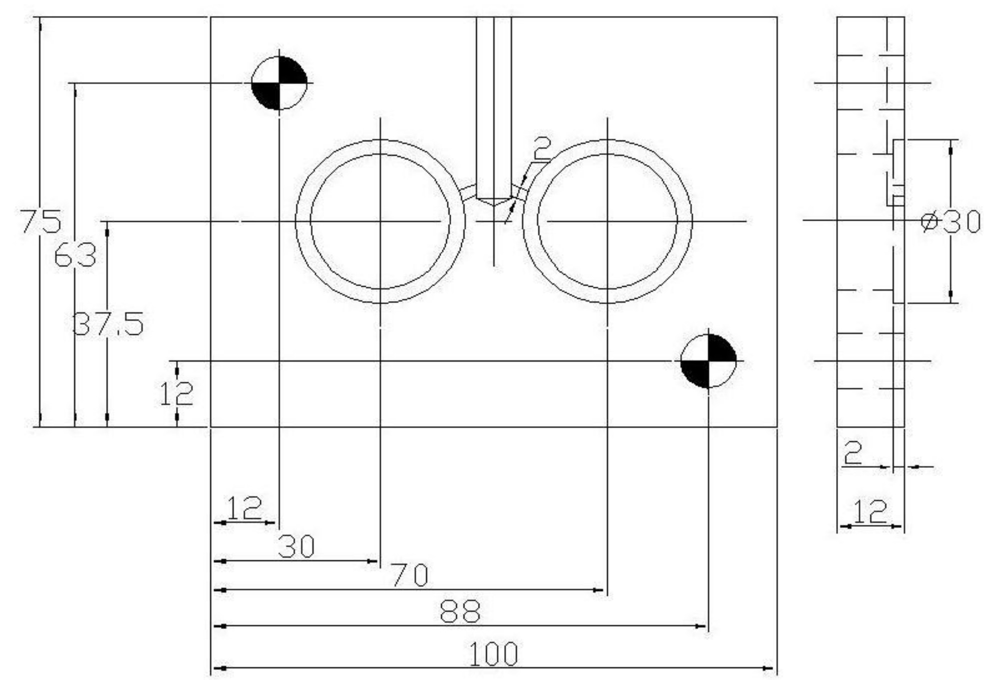
Exercise – II Multi Cavity Injection Mould




CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
1
75
63
37.5
15
12
R5
10
12
30
70
88
100
10
3
12
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE-DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
CORE PLATE
MULTI CAVITY-INJECTION MOULDING
DRG.No. 03 22 66 002
DRG.SHEET 2 OF 7
REVISION R0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.


3
2
CADD FILE :
2
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMNS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE IN
OVER
UP TO & INCL.
TOLERANCE
75
63
37.5
12
34.5
6
12
30
70
88
100
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE-DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
STRIPPER PLATE
DRG.No.
03 22 66 002
SCALE
DRG.SHEET
OF
REVISION
R/0
MULTI CAVITY INJECTION MOULDING
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

CADD FILE :



NOTE:-

ALL DRILLED HOLES ARE 1x60° CHAMFER

ALL SHARP CORNERS ARE 1x45° CHAMFER

MODEL:	HARDNESS:	FINISHING:	ITE-DGL
MATL:	QTY:	PART NO:	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

CAVITY PLATE

MULTI CAVITY-INJECTION MOULDING

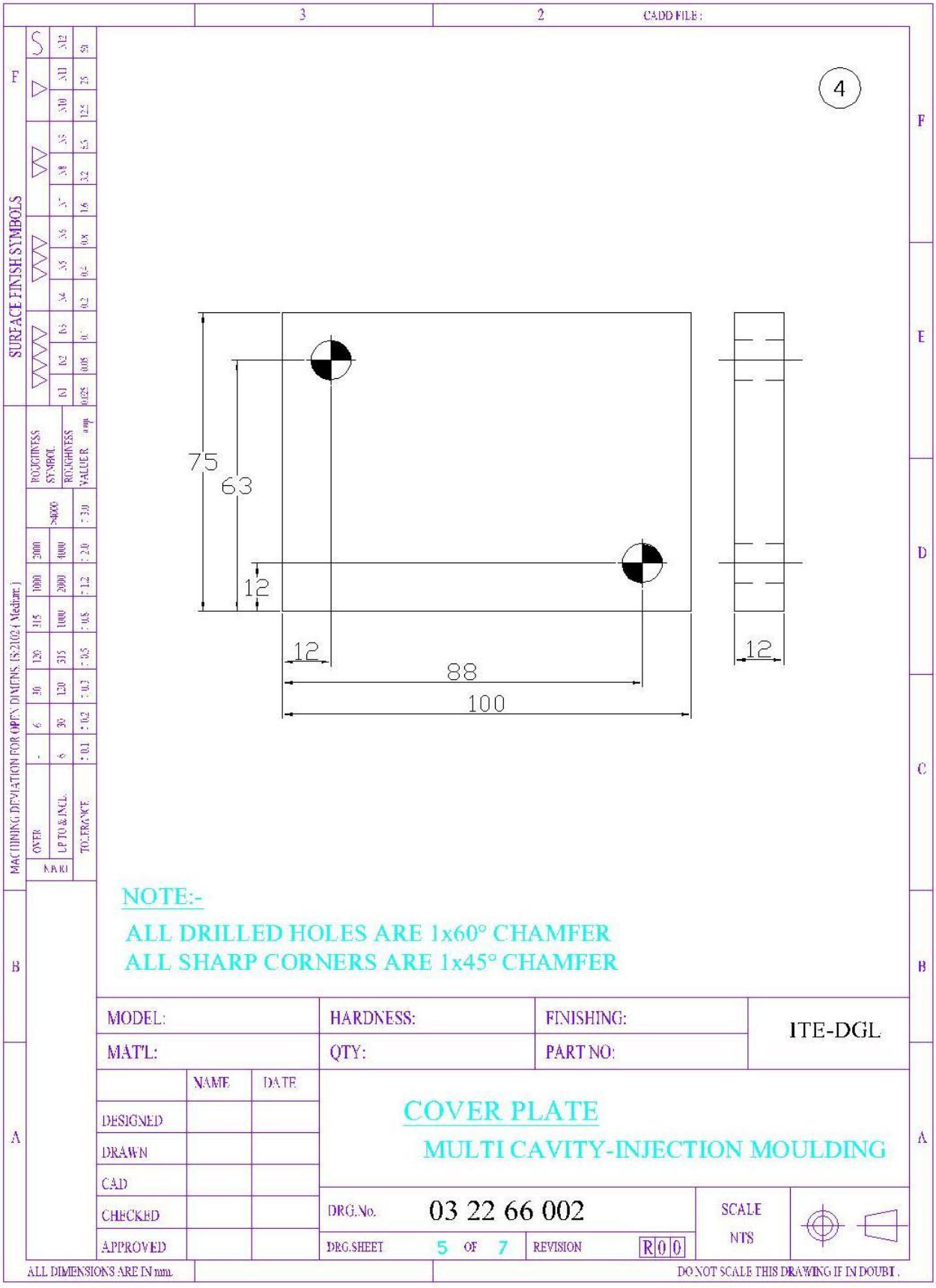
DRG.No. 03 22 66 002

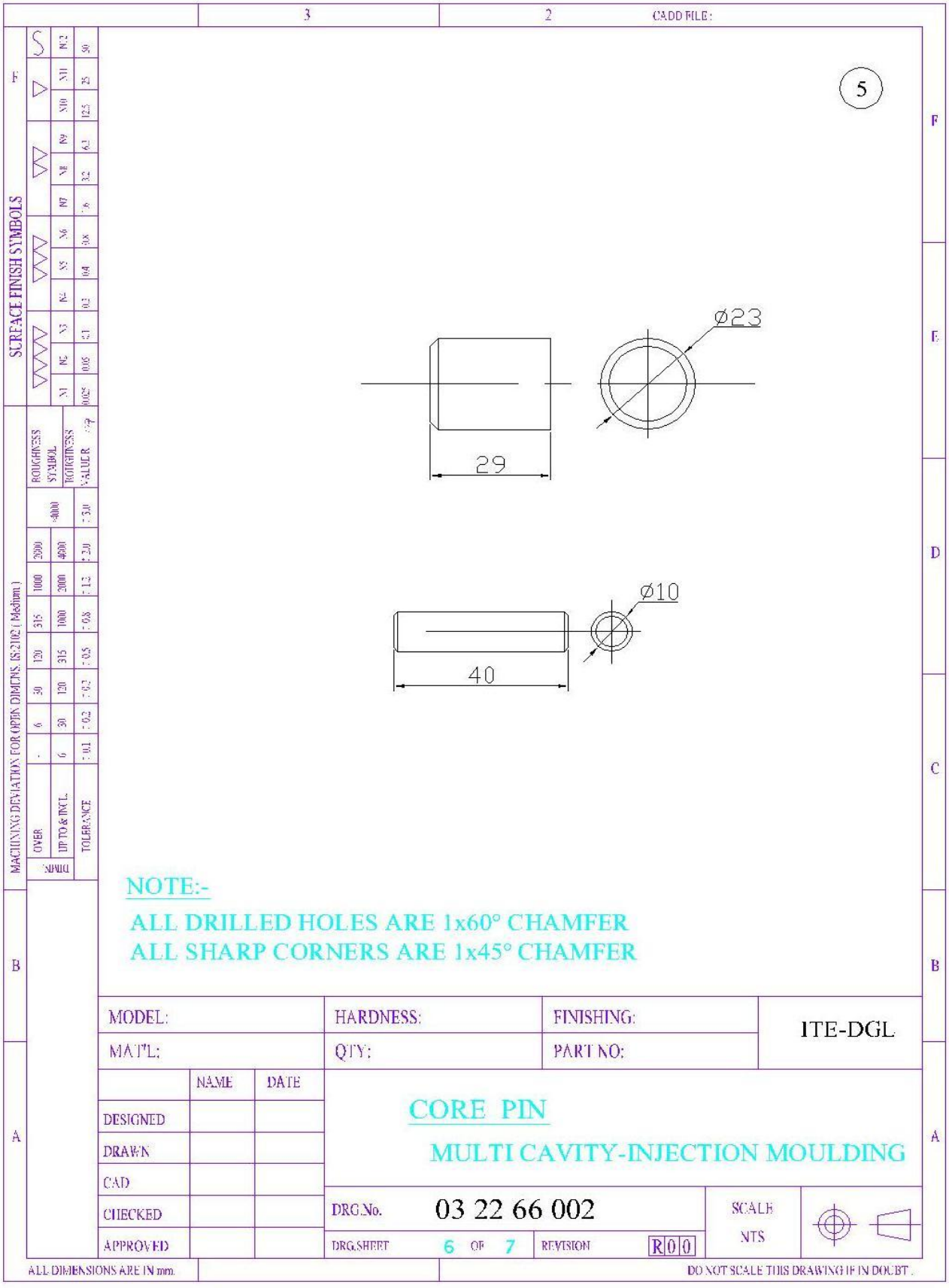
DRG.SHEET 4 OF 7 REVISION R00

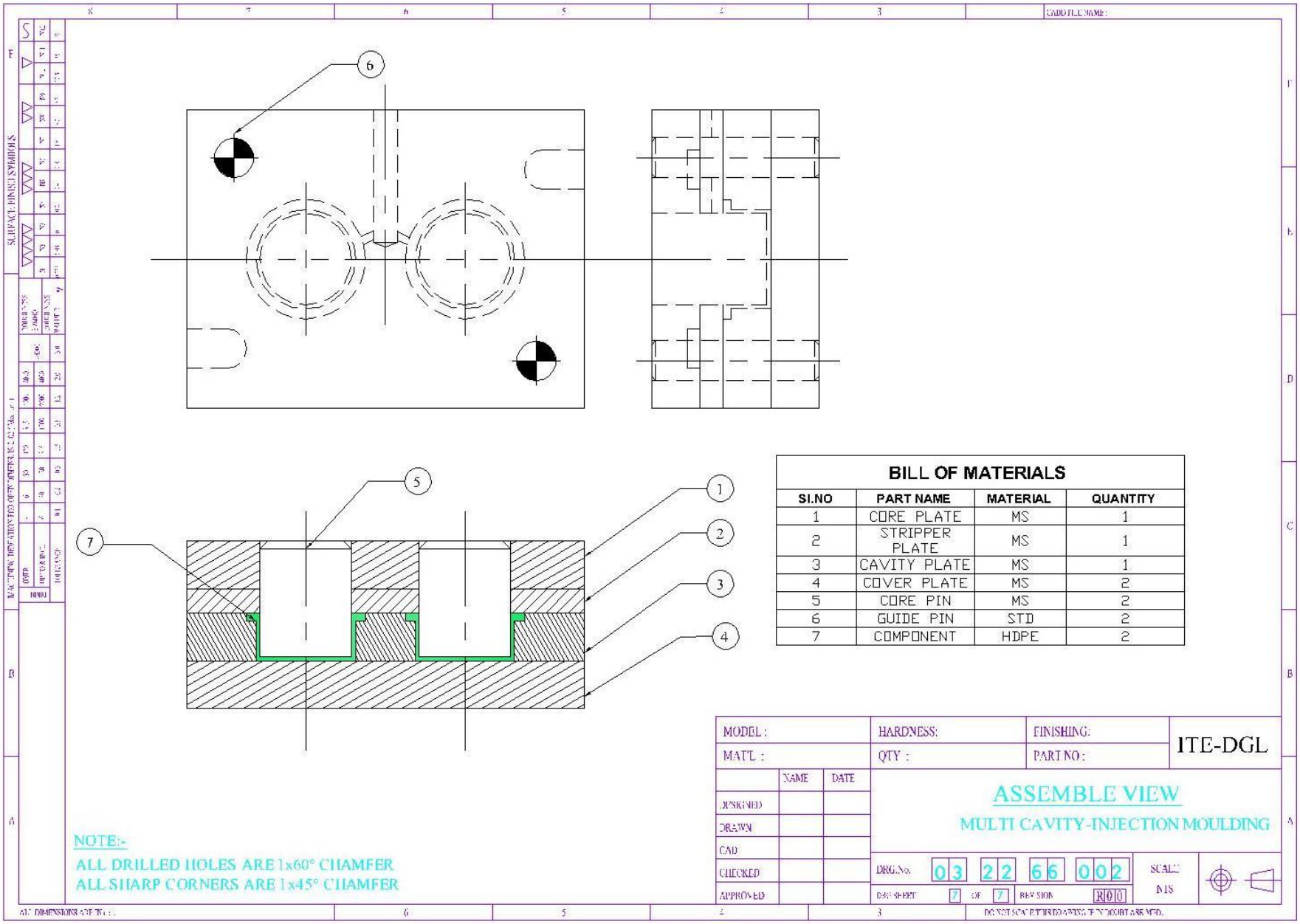
SCALE NTS

ALL DIMENSIONS ARE IN mm.

DO NOT SCALE THIS DRAWING IF IN DOUBT.


CADD FILE :
4
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. (IS:2102-1 Medium)
TOLERANCE
OVER
UP TO & INCL.
75
63
12
12
88
100
12
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE-DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
COVER PLATE
MULTI CAVITY-INJECTION MOULDING
DRG.No. 03 22 66 002
SCALE NTS
DRG.SHEET 5 OF 7
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.


3
2
CADD FILE :
5
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. (IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a
Ø23
29
Ø10
40
NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER
MODEL:
HARDNESS:
FINISHING:
ITE-DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
CORE PIN
MULTI CAVITY-INJECTION MOULDING
DRG.No. 03 22 66 002
DRG.SHEET 6 OF 7
REVISION R 0 0
SCALE NTS
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .



BILL OF MATERIALS			
SI.NO	PART NAME	MATERIAL	QUANTITY
1	CORE PLATE	MS	1
2	STRIPPER PLATE	MS	1
3	CAVITY PLATE	MS	1
4	COVER PLATE	MS	2
5	CORE PIN	MS	2
6	GUIDE PIN	STD	2
7	COMPONENT	HDPE	2

NOTE:-
ALL DRILLED HOLES ARE 1x60° CHAMFER
ALL SHARP CORNERS ARE 1x45° CHAMFER

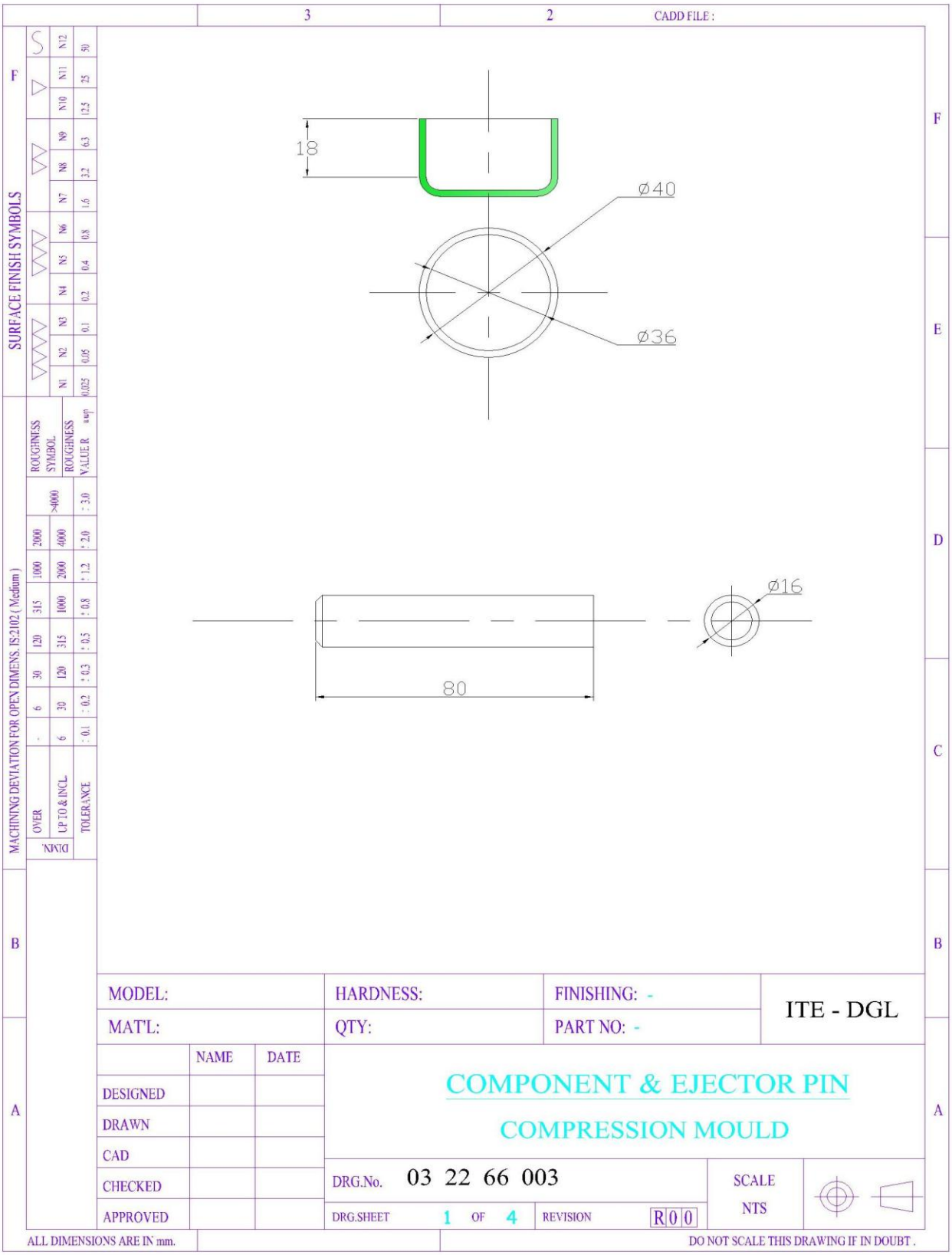
MODEL :	HARDNESS:	FINISHING:	ITE-DGL
MATL :	QTY :	PART NO :	

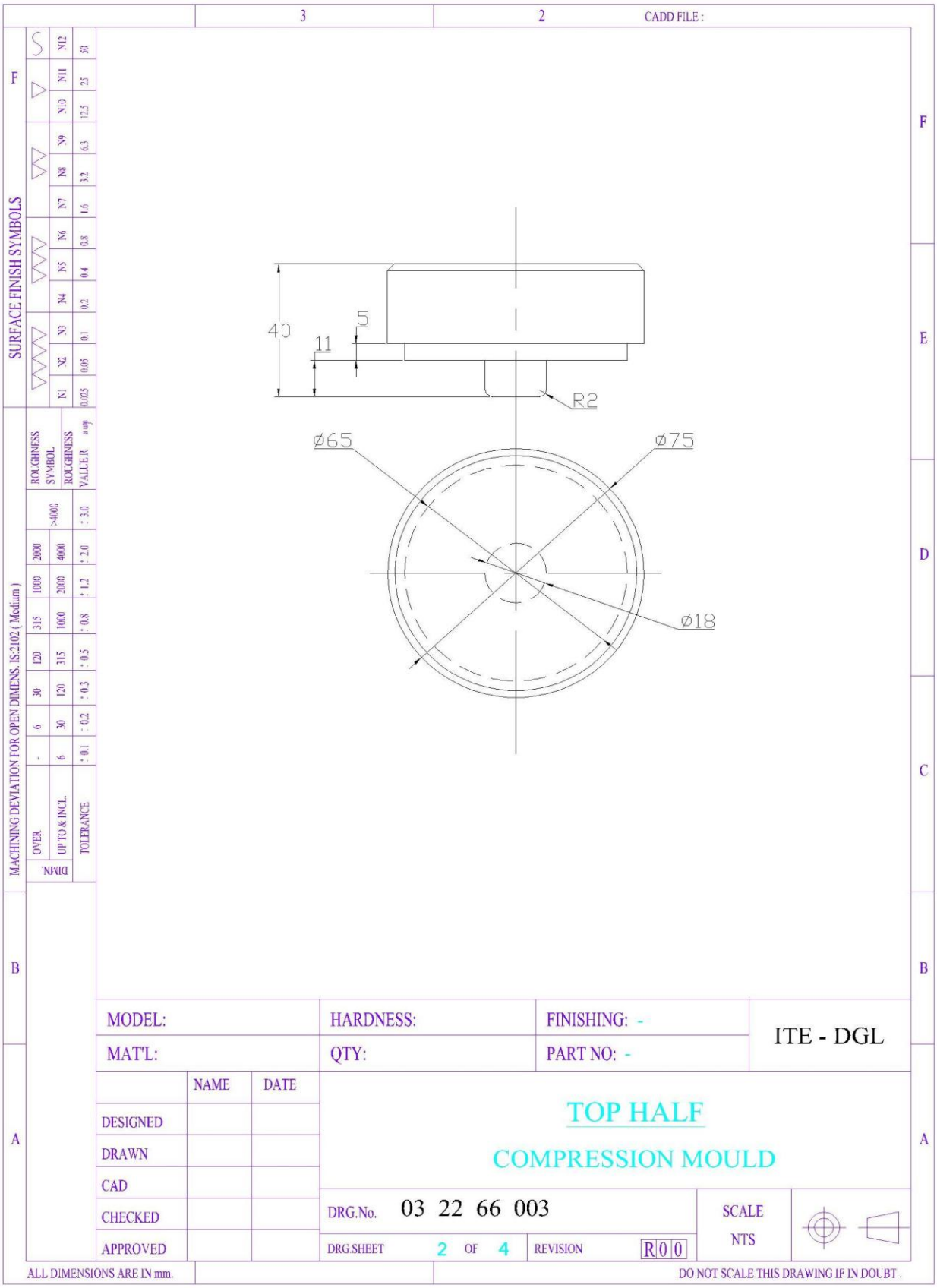
	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

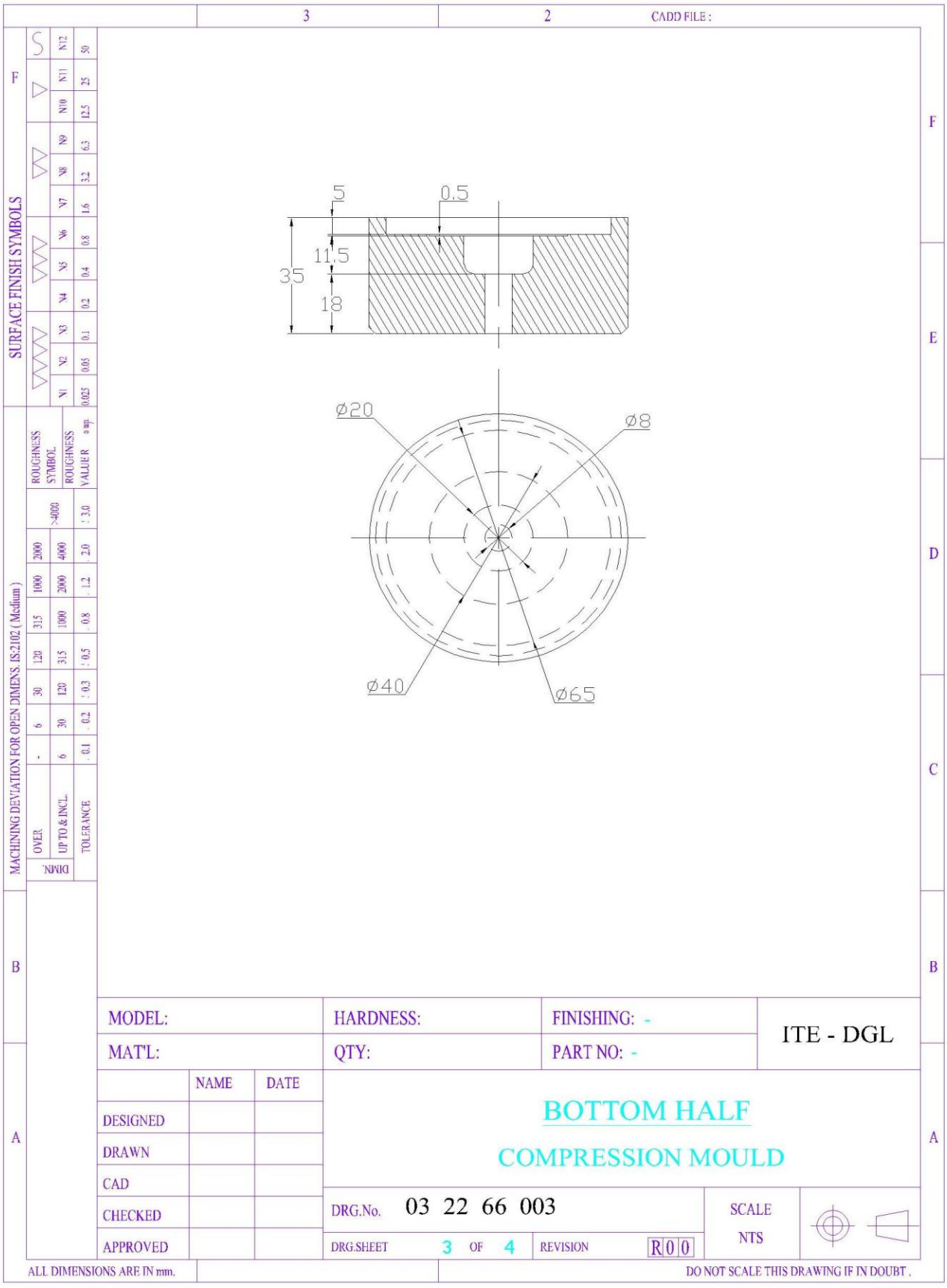
ASSEMBLE VIEW
MULTI CAVITY-INJECTION MOULDING

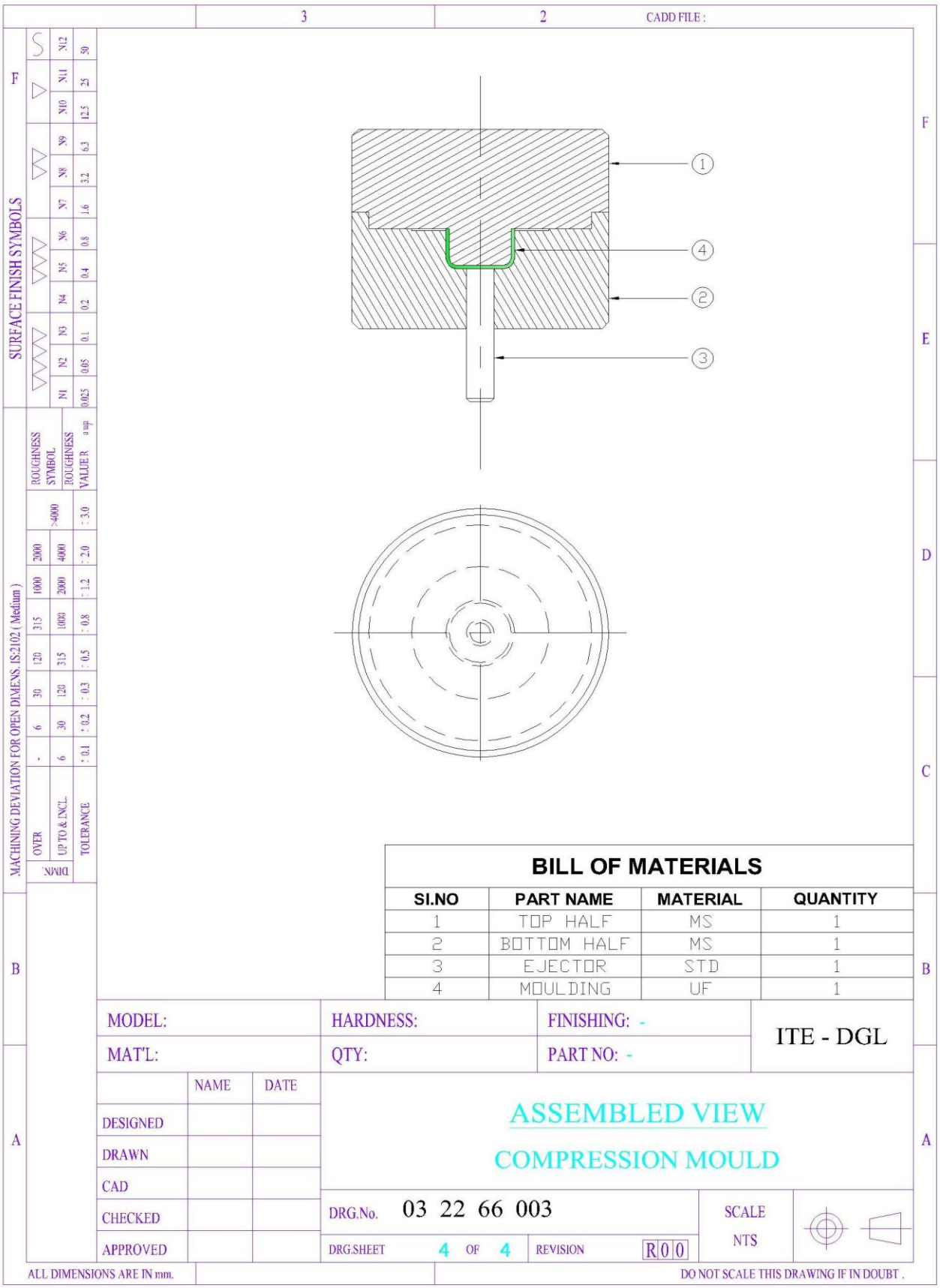
DRG.No. 03 22 66 002 SCALE: NTS
DRG SHEET 7 OF 7 REVISION R00

Exercise – III Compression Mould

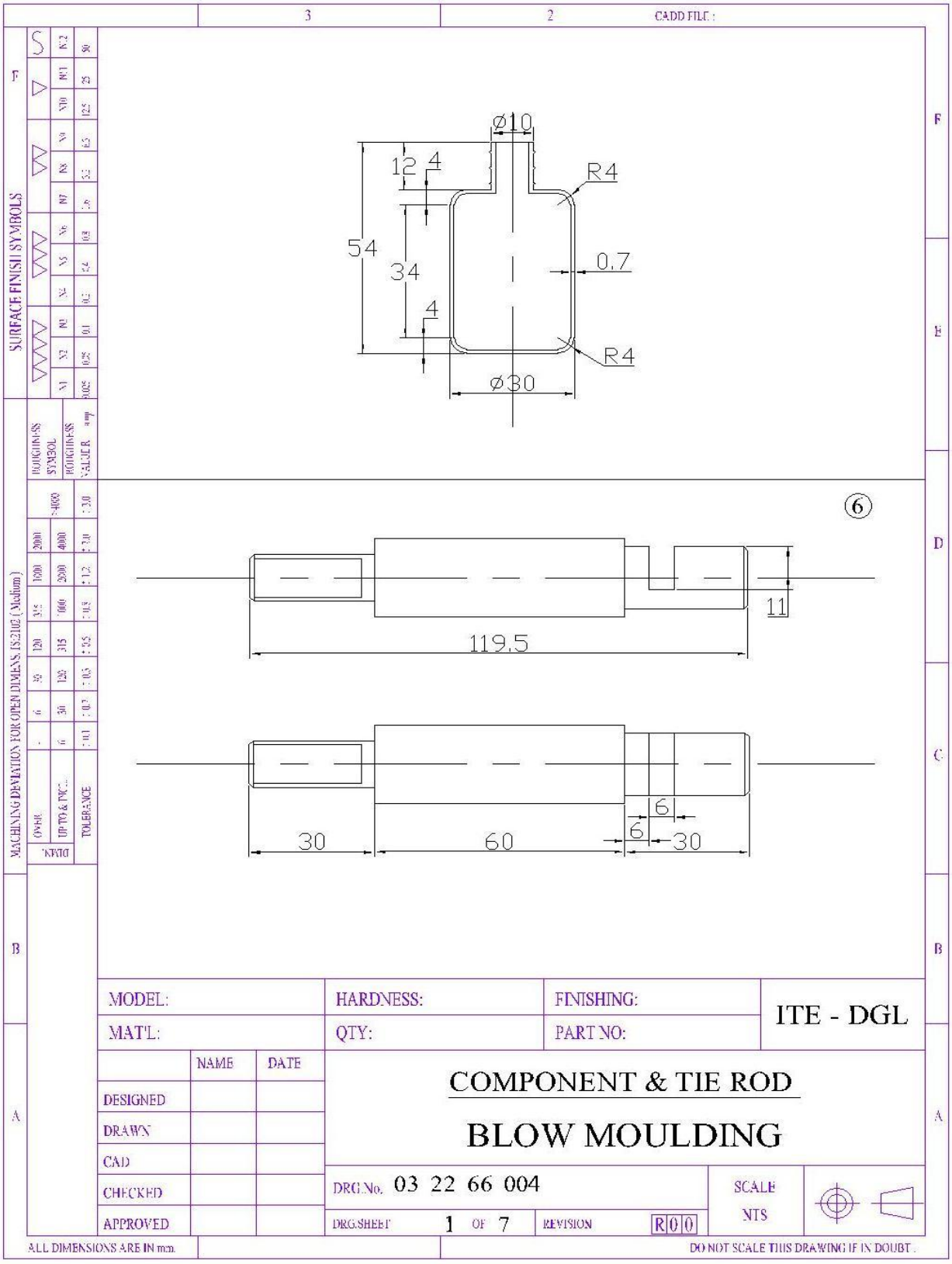


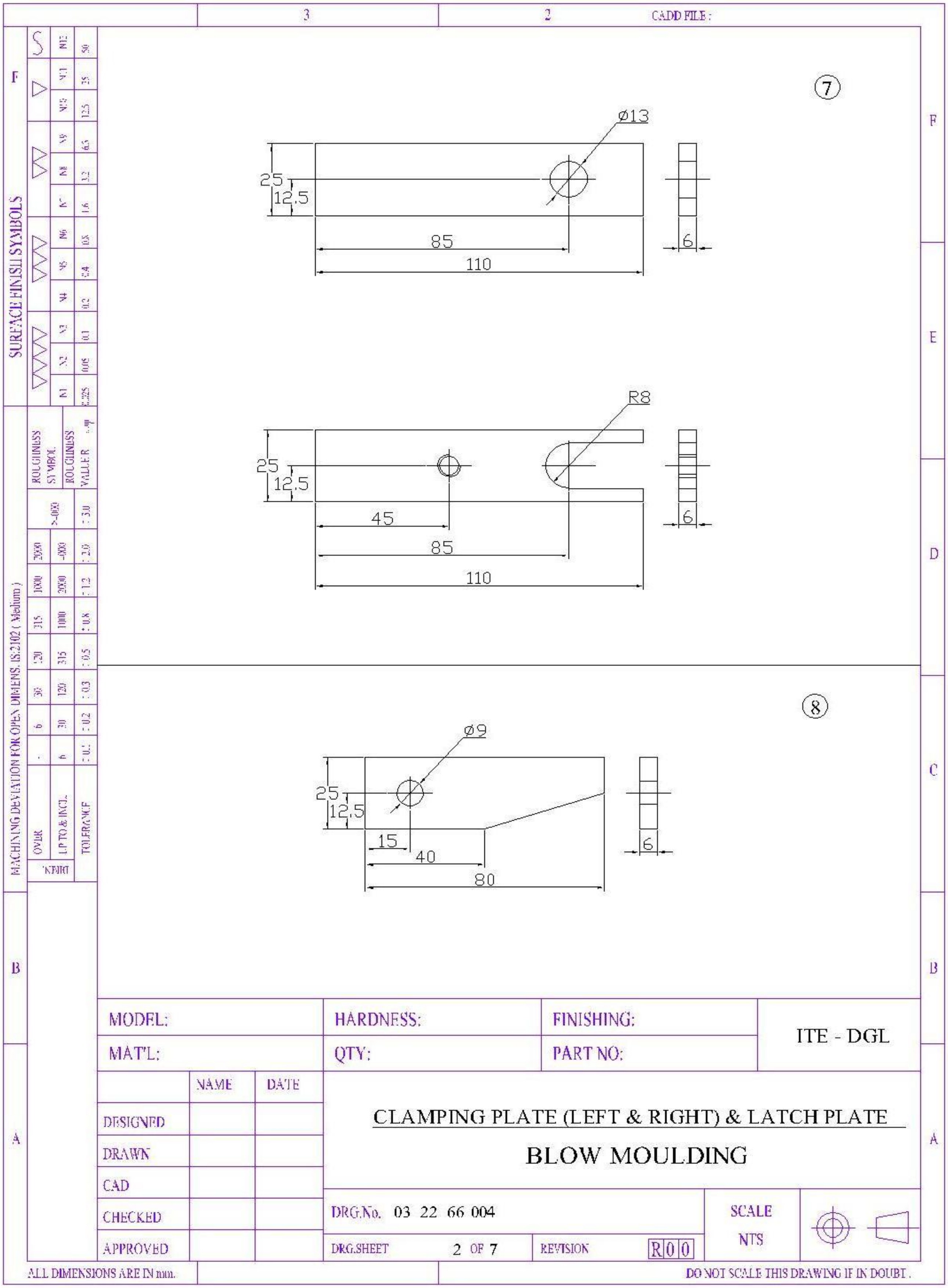

3
2
CADD FILE :
F
B
A
SURFACE FINISH SYMBOLS
N12 50
N11 25
N10 12.5
N9 6.3
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a um
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
DIMN.
OVER
UP TO & INCL.
TOLERANCE
- 6 ± 0.1
6 30 ± 0.2
30 120 ± 0.3
120 315 ± 0.5
315 1000 ± 0.8
1000 2000 ± 1.2
2000 4000 ± 2.0
>4000 ± 3.0
40
5
11
R2
ø65
ø75
ø18
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
TOP HALF
COMPRESSION MOULD
DRG.No. 03 22 66 003
SCALE NTS
DRG.SHEET 2 OF 4
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

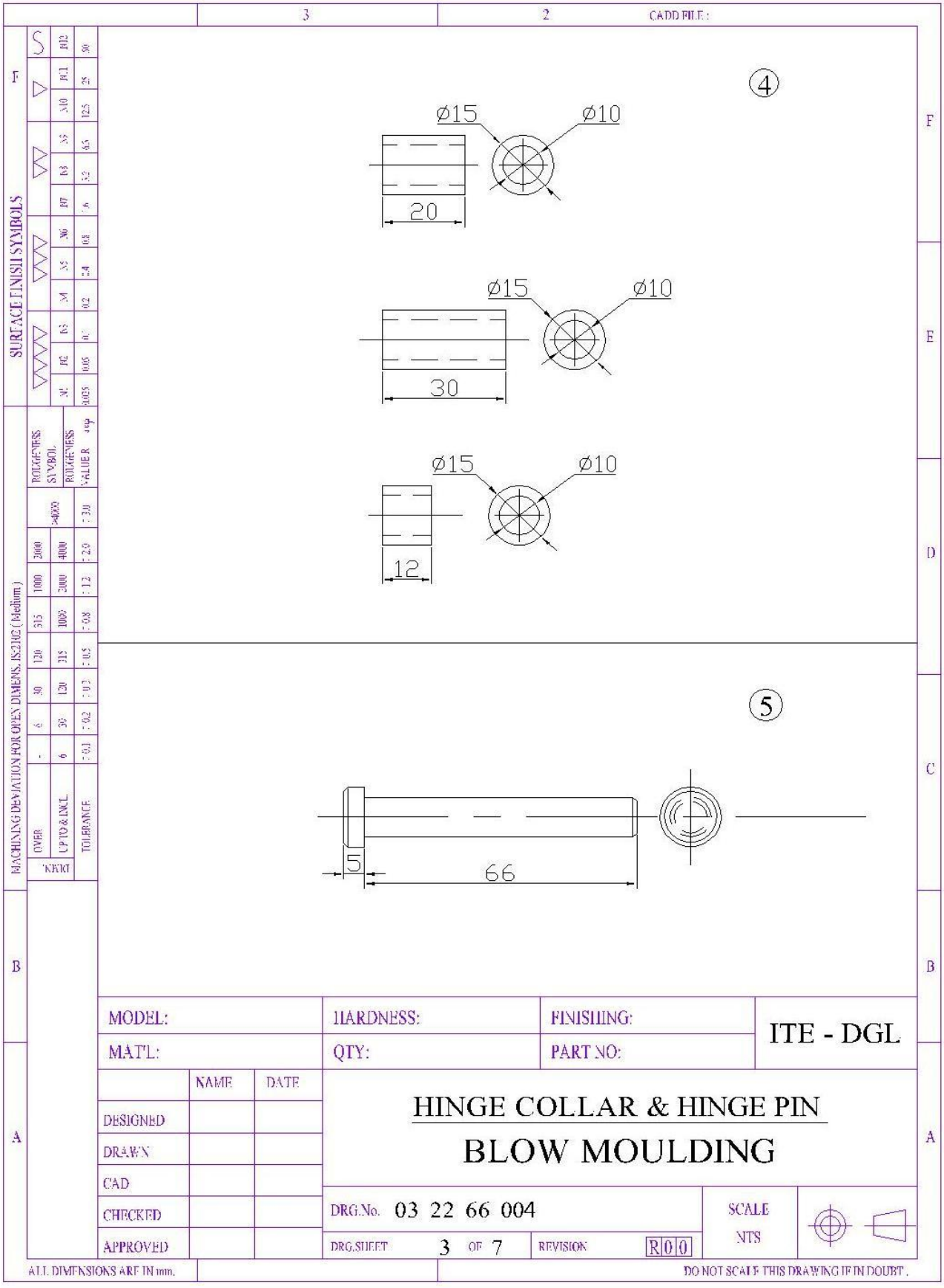

3
2
CADD FILE :
SURFACE FINISH SYMBOLS
N12 50
N11 25
N10 12.5
N9 6.3
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
ROUGHNESS SYMBOL
ROUGHNESS VALUE Ra mm
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
DIMN. OVER UP TO & INCL. TOLERANCE
- 6 ± 0.1
6 30 ± 0.2
30 120 ± 0.3
120 315 ± 0.5
315 1000 ± 0.8
1000 2000 ± 1.2
2000 4000 ± 2.0
>4000 ± 3.0
5
0.5
11.5
35
18
ø20
ø8
ø40
ø65
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
BOTTOM HALF
COMPRESSION MOULD
DRG.No. 03 22 66 003
SCALE NTS
DRG.SHEET 3 OF 4
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

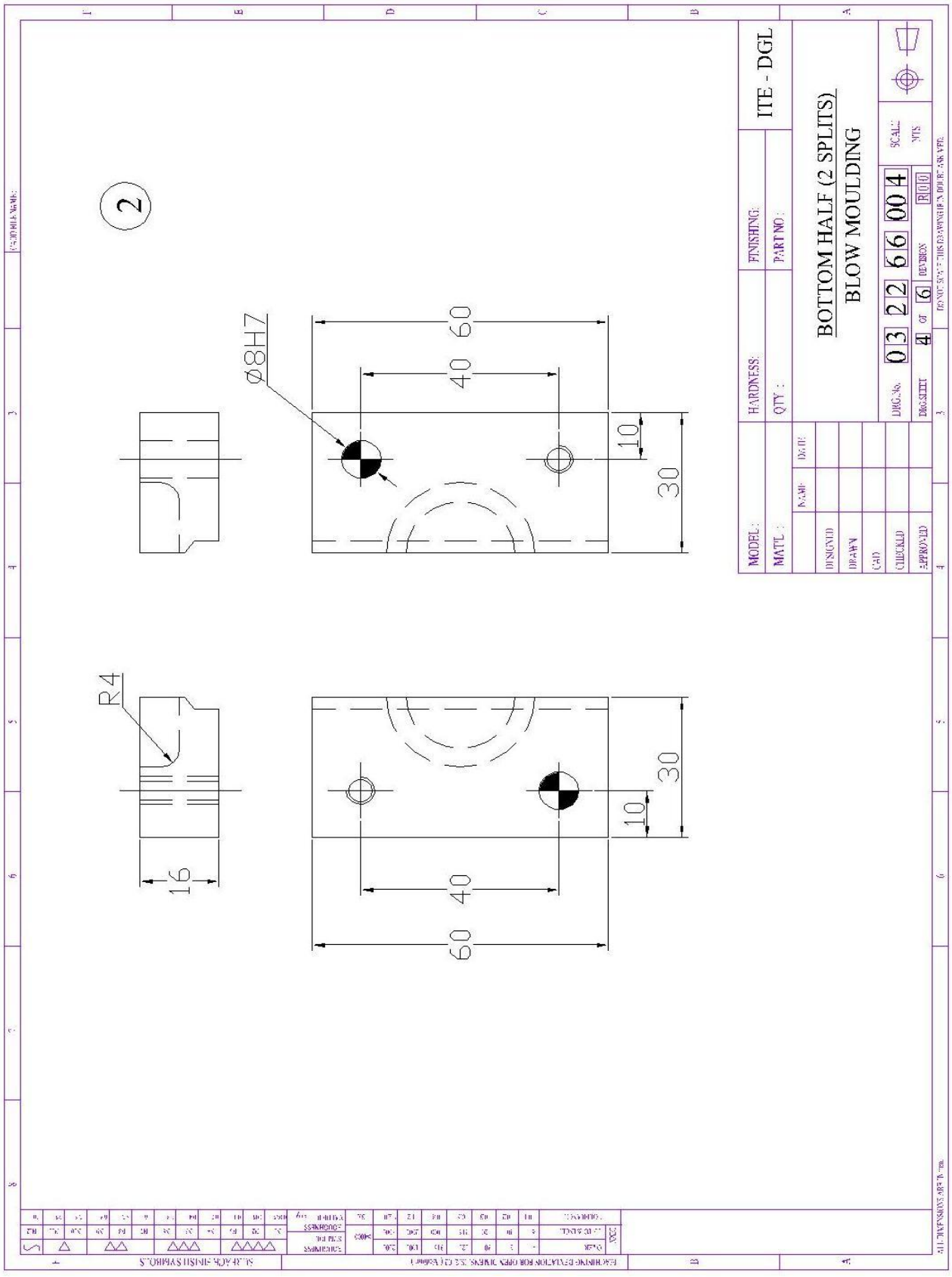

3
2
CADD FILE :
SURFACE FINISH SYMBOLS
N12 50
N11 25
N10 12.5
N9 6.3
N8 3.2
N7 1.6
N6 0.8
N5 0.4
N4 0.2
N3 0.1
N2 0.05
N1 0.025
ROUGHNESS SYMBOL
ROUGHNESS VALUE R a mµ
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
DIMN.
OVER
UP TO & INCL.
TOLERANCE
- 6 ± 0.1
6 30 ± 0.2
30 120 ± 0.3
120 315 ± 0.5
315 1000 ± 0.8
1000 2000 ± 1.2
2000 4000 ± 2.0
>4000 ± 3.0
1
4
2
3
BILL OF MATERIALS
SI.NO | PART NAME | MATERIAL | QUANTITY
1 | TOP HALF | MS | 1
2 | BOTTOM HALF | MS | 1
3 | EJECTOR | STD | 1
4 | MOULDING | UF | 1
MODEL:
HARDNESS:
FINISHING: -
ITE - DGL
MAT'L:
QTY:
PART NO: -
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
ASSEMBLED VIEW
COMPRESSION MOULD
DRG.No. 03 22 66 003
SCALE NTS
DRG.SHEET 4 OF 4
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .

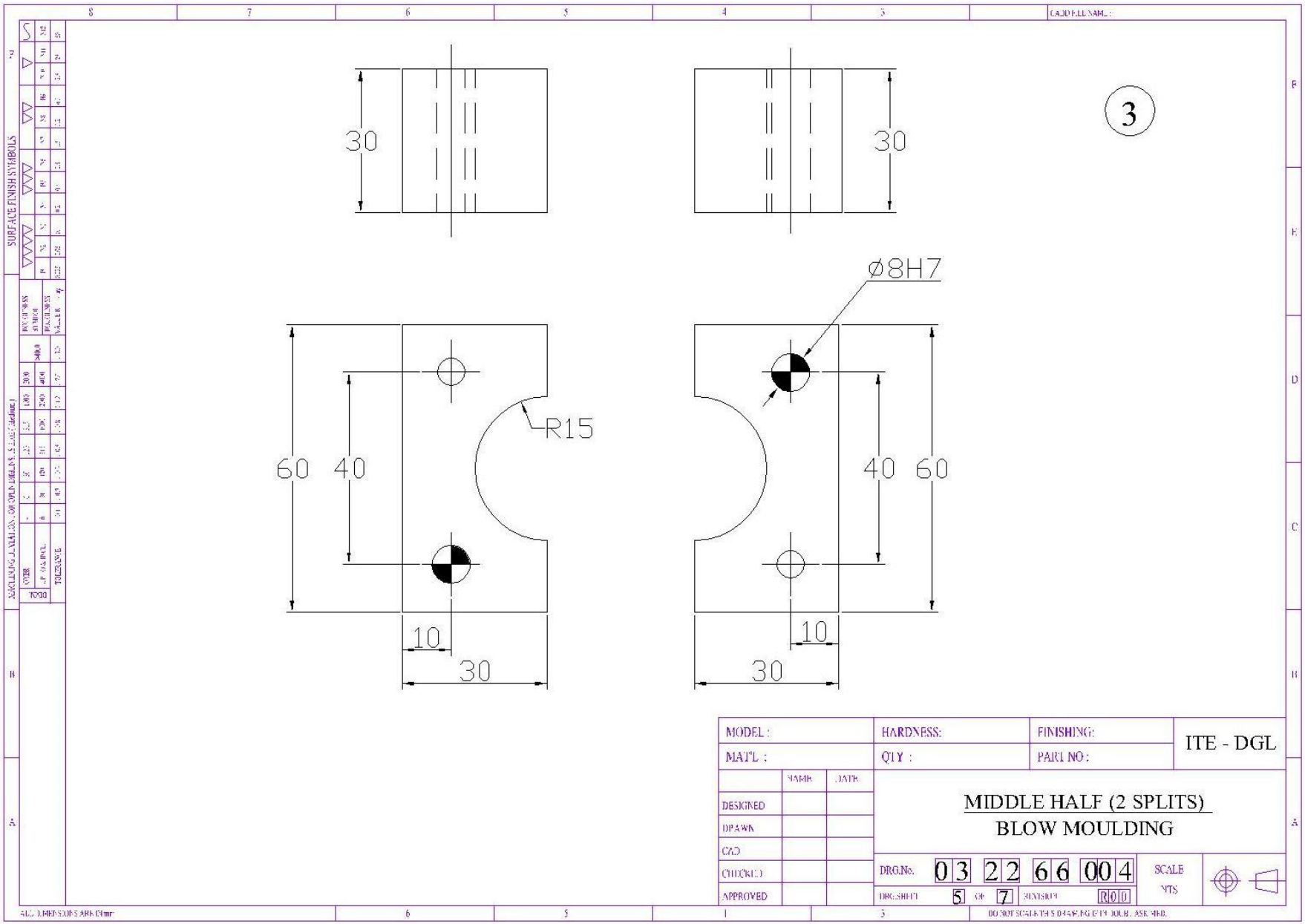
Exercise – IV Blow Mould




3
2
CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
ROUGHNESS SYMBOL
ROUGHNESS VALUE R
OVER
UP TO & INCL.
TOLERANCE
7
Ø13
25
12.5
85
110
6
R8
45
8
Ø9
15
40
80
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
CLAMPING PLATE (LEFT & RIGHT) & LATCH PLATE
BLOW MOULDING
DRG.No. 03 22 66 004
SCALE
NTS
DRG.SHEET 2 OF 7
REVISION R00
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT .


CADD FILE :
SURFACE FINISH SYMBOLS
MACHINING DEVIATION FOR OPEN DIMENS. IS:2102 (Medium)
④
Ø15
Ø10
20
Ø15
Ø10
30
Ø15
Ø10
12
⑤
5
66
MODEL:
HARDNESS:
FINISHING:
ITE - DGL
MAT'L:
QTY:
PART NO:
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
HINGE COLLAR & HINGE PIN
BLOW MOULDING
DRG.No. 03 22 66 004
SCALE NTS
DRG.SHEET 3 OF 7
REVISION R0 0
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THIS DRAWING IF IN DOUBT.


2
Ø8H7
60
40
10
30
R4
16
10
30
40
60
BOTTOM HALF (2 SPLITS)
BLOW MOULDING
ITE - DGL
03 22 66 00 4
SCALE: NTS
MODEL :
MATTE :
HARDNESS:
QTY :
FINISHING:
PART NO :
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
DATE


3
30
30
Ø8H7
R15
60
40
40
60
10
30
10
30
MODEL :
HARDNESS:
FINISHING:
ITE - DGL
MAT'L :
Q'TY :
PART NO :
NAME
DATE
DESIGNED
DRAWN
CAD
CHECKED
APPROVED
MIDDLE HALF (2 SPLITS)
BLOW MOULDING
DRG.No. 03 22 66 004
SCALE
NTS
DRG.SHEET 5 OF 7
SUBSHEET R0 0

1
ø8H7
60
40
10
30
4
12
4
20
10
60
40
10
30
ITE - DGL
TOP HALF (2 SPLITS)
BLOW MOULDING
MODEL :
MATL :
HARDNESS:
QTY :
FINISHING:
PART NO:
DRG.No. 03 22 66 004
SCALE NTS
DESIGNED
DRAWN
CAD
CHECKED
APPROVED

NOTE

1. ALL DIMENSIONS ARE IN mm

2. PROVIDE PUNCH/DIE CLEARENCE PERSIDE AS 0.001

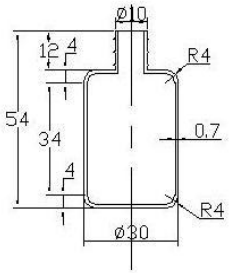
3. THE DIE PLATE SHALL BE HARDENED AND TEMPERED TO 60-62 HRC

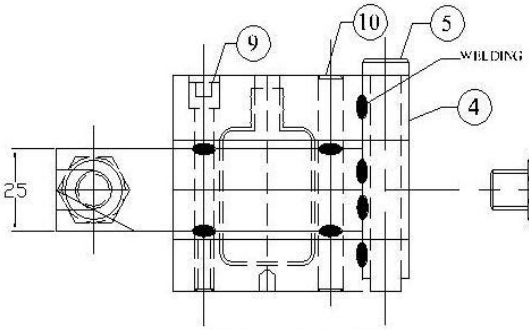
4. THE PUNCH SHALL BE HARDENED TO 60-62 HRC

5. AVOID SHARP CORNERS

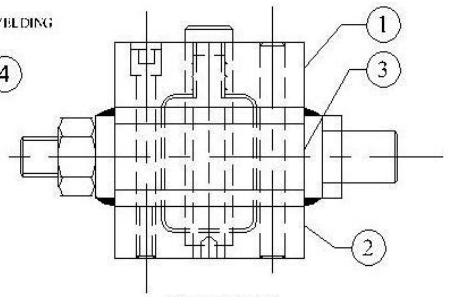
6. FOR DIMENSIONS WITHOUT TOLERANCE SHALL BE PROVIDED AS ISO 2768-1

COMPONENT

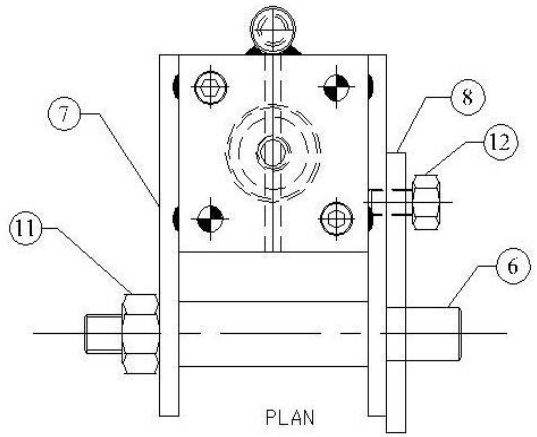




RIGHT SIDE VIEW



ELEVATION



PLAN

BILL OF MATERIALS

SI.NO	PART NAME	MATERIAL	QUANTITY
1	TOP HALF	MS	2
2	BOTTOM HALF	MS	2
3	MIDDLE HALF	MS	2
4	HINGE COLLAR	MS	3
5	HINGE PIN	MS	1
6	TIE ROD	MS	1
7	CLAMPING PLATE	MS	2
8	LATCH	MS	1
9	ALLEN SCREW M6	STD	2
10	DOWELL ø8	STD	2
11	NUT M12	STD	1
12	BOLT M8	STD	1

MODEL :	HARDNESS:	FINISHING:	ITE - DGL
MATL. :	QTY :	PART NO :	

	NAME	DATE
DESIGNED		
DRAWN		
CAD		
CHECKED		
APPROVED		

ASSEMBLY DRAWING
BLOW MOULDING

DRG No. 03 22 66 004 SCALE NTS

DRG SHEET 7 OF 7 REVISION R00

ALL DIMENSIONS ARE IN mm. DO NOT SCALE THIS DRAWING IF IN DOUBT ASK ME

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

(TOOL& DIE)

II YEAR / III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

32267 - PROJECT WORK

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING(TOOL & DIE)

Course Code : 1220

Subject Code : 32267

Semester : VI

Subject Title : Project Work

.**TEACHING AND SCHEME OF EXAMINATIONS:**

No. of Weeks per Semester: 15 Weeks

Subject	Instruction		Examination		
	Hours/ Week	Hours/ Semester	Assessment Marks		
			Internal	Board Exam	Total
PROJECT WORK	4	60	25	75	100

Minimum Marks for Pass is 50 out of which minimum 35 marks should be obtained out of 75 marks in the board Examination alone.

OBJECTIVES:

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment
- Get exposure on industrial environment and its work ethics.
- Understand what entrepreneurship is and how to become an entrepreneur.
- Learn and understand the gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.

- Understand the facts and importance of environmental management.
- Understand and gain knowledge about disaster management

INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Detail of assessment	Period of assessment	Max. Marks
First Review	6th week	10
Second Review	12th week	10
Attendance	Entire semester	5
Total		**25**

EVALUATION FOR BOARD EXAMINATION:

Details of Mark allocation	Max Marks
Marks for Report Preparation, Demo, Viva-voce	65
Marks for answers of 4 questions which is to be set by the external examiner from the given question bank consisting of questions in the following two topics Disaster Management and Environmental Management. Out of four questions two questions to appear from each of the above topics i.e. 2 questions x 2 topics = 4 questions 4 questions x 2 ½ marks = 10 Marks	10
Total	**75**

DETAILED SYLLABUS

ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENVIRONMENTAL MANAGEMENT

Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance

of Pollution Control – Types of Industries and Industrial Pollution.

Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies.

Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health.

Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management.

Noise pollution management – Effects of noise on people – Noise control methods.

2. DISASTER MANAGEMENT

Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life..

Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings - Cyclone shelters – Warning systems.

Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

LIST OF QUESTIONS

1. ENVIRONMENTRAL MANAGEMENT

1. What is the responsibility of an Engineer-in-charge of an Industry with respect to Public Health?
2. Define Environmental Ethic.
3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control? What are all the different organizations you know, which deal with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / Automobile / Cement factory.
6. What is meant by Hazardous waste?

7. Define Industrial waste management.
8. Differentiate between garbage, rubbish, refuse and trash based on their composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal?
11. What are the different methods of disposal of solid wastes?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term 'Environmental Waste Audit'.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth of daily cover.
16. Describe any two methods of converting waste into energy.
17. What actions, a local body such as a municipality could take when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.
19. What is the difference between municipal and industrial effluent ?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye industries / electroplating industries / cement plants / leather industries (any two may be asked)
21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments "Sedimentation" and "Floatation" processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.
25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.

31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.
34. Discuss briefly the causes for global warming and its consequences
35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere? State few reasons for its destruction.
39. Explain the mechanism by which hearing damage occurs.
40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Explain briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used ? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.
45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

2. DISASTER MANAGEMENT

1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.

10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter ? When and where it is provided ? What are its requirements ?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river ?
18. What are the causes for fire accidents ? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings ? What are its requirements ?
20. How the imamates of a multistory building are to be evacuted in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding ?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.

31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearly lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?
41. Explain the legal / financial problems the management has to face if safely measures taken by them are found to be in adequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

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