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ABSTRACT

The curriculum guide was developed to serve as a statewide model for Virginia auto body repair programs. The guide is designed to 1,080 hours of instruction in eleven blocks: orientation, introduction, welding and cutting, techniques of shaping metal, body filler and fiberglass repairs, body and frame, removing and replacing damaged parts, basic automotive electricity, upholstery and glass, refinishing, and shop management. Each block presents outlined units of instruction, lecture subject matter, and activities, correlated to a list of instructional aids. The suggested instructional aids include materials such as films, filmstrips, books, pamphlets, manuals, and charts. A 50-page unit guide on automotive refinishing is appended and includes: suggested teaching methods, instructor's lesson plans, student information sheets, an assignment sheet, and tool specifications. (EC)

Instructional Guide For Autobody Repair

Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Richmond, Virginia 23216
in cooperation with
The Department of Education
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

April 1973

FOREWORD

This Autobody Repair Guide represents another accomplishment in our effort to provide State Instructional Guides for all of the major fields of instruction in Trade and Industrial Education.

The purpose of the Guide is explained in the Preface and the philosophy of autobody instruction is in another section that follows, making it rather unnecessary for further elaboration.

Again, we wish to express our appreciation to the instructors and the teacher educators at V.P.I. & S.U. who worked diligently last summer and during the year to structure and write the contents of this Autobody Guide.

George W. Swartz
State Supervisor
Trade and Industrial Education
State Department of Education
Richmond, Virginia

April, 1973

PREFACE

This curriculum guide was developed to serve as a State-wide model for Virginia Autobody Repair programs. The individual instructor may utilize this curriculum guide in a manner deemed most advantageous to his situation.

This guide is designed for 1080 hours of instruction and was developed by a group of Virginia Autobody instructors enrolled in the course VIEd. 498, Curriculum Development for Autobody Instructors--Vocational Technical Education Division; Virginia Polytechnic Institute and State University; Blacksburg, Virginia; June, 1972.

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AUTOBODY REPAIR

PHILOSOPHY:

Today, as never before in the history of mankind, young men face a world of scientific and technological advancement almost beyond comprehension. It, therefore, becomes necessary that they equip themselves for their respective place in society. Those choosing to embark on a career in the autobody field will find not only great challenge but the rewards of a job well done. Vocational education excludes no one, regardless of social or economic status, age, race or religion. It is felt that through vocational education the student will develop the broad educational background and skills necessary to meet or exceed the job entry level requirements. The autobody field has a history of consistent growth and expansion, knowing almost limitless boundaries. With statistics indicating a steady population increase, one can, by comparison, understand what this will do for the autobody field as to the need for more trained personnel. It is the sole purpose of the vocational autobody repair program to launch the student on a successful career in the world of automobiles.

AUTOBODY REPAIR

OBJECTIVES:

The student:

1. will gain a knowledge and skills in the use of hand tools, power tools, and special equipment maintenance and safety.
2. will gain knowledge and skill necessary to identify the main parts of a car body and under frame.
3. will gain knowledge and skill in oxy-acetylene and arc welding.
4. will gain knowledge and skill in the removal and replacement of damaged parts and how to repair them on or off the car.
5. will gain knowledge and skill in using lead and plastic filler to repair damaged parts.
6. will gain knowledge and skill in the use of primer and glazing putty.
7. will gain knowledge and skill in refinishing a repaired area.
8. will gain knowledge and skill in refinishing a complete car.
9. will gain knowledge and skill in the use of hydraulic tools and body dozers.
10. will gain knowledge and skill in removing and replacing upholstery, glass and mouldings.
11. will gain knowledge and skill in writing and preparing estimates.
12. will develop pride and craftsmanship in his work.
13. will develop good safety habits in the interest of others as well as oneself.
14. will develop a good relationship with other people.
15. will develop the ability to solve problems with a minimum amount of help.
16. will practice honesty in all phases of his work.
17. will strive toward becoming a leader and good citizen in his community and in his chosen profession.

BLOCK TIME SCHEDULE (Suggested)

BLOCK NUMBER		LECTURE	LABORATORY	TOTAL
1.	Orientation	3	12	15
2.	Introduction	4	17	21
3.	Welding and Cutting	18	72	90
4.	Techniques of Shaping Metal	34	136	170
5.	Body Filler and Fiberglass Repairs	34	136	170
6.	Body and Frame	30	120	150
7.	Removing and Replacing of Damaged Parts	25	100	125
8.	Basic Automotive Electricity	2	8	10
9.	Upholstery and Glass	9	21	30
10.	Refinishing	55	220	275
11.	Shop Management	4	20	24
	TOTALS	218	862	1,080

SUGGESTED UNITS, INFORMATION, ACTIVITIES, AND REFERENCES FOR AUTOBODY REPAIR

INDEX CODE FOR REFERENCES AND INSTRUCTIONAL AIDS WILL BE FOUND IN THE APPENDIX

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ORIENTATION

BLOCK ONE

A. School Policies and Procedures

B. General Safety

C. Job Opportunities

D. Shop Policy

Units of Instruction	Information	Student Activities	Instructional Aids
A. School Policies and Procedures	Lecture Introduce student to information furnished by individual school stressing all operational policies	The student will complete all applicable forms	A-1 A-2 B-1 E-9 H-1
B. General Safety	Lecture and Appropriate Demonstration Provide a basic understanding of general safety: a. Stress proper grooming and use of safety equipment b. Safety of co-worker c. Fire safety (extinguishers) d. Electrical safety e. Tool and equipment safety f. Shop safety g. Storage of flammable and combustable materials	Explain and demonstrate all safety equipment and related apparatus	A-3 A-4 A-5 A-6 A-7 A-8 B-2 B-3 B-4 J-1 A-9
C. Job Opportunities	Lecture To acquaint student with job opportunities after training: a. Body repairman b. Truck repairman c. Frame technician d. Painter e. Insurance adjuster	Conduct individual research concerning job opportunities and report to the class	F-1 F-2 F-3 F-4 F-5 F-6 F-7 F-8

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
C. Job Opportunities (continued)	Lecture (continued) f. Shop estimator g. Shop manager h. Shop owner i. Glass repairman j. Welder k. Upholsterer l. Auto salesman m. Parts salesman n. Metal worker o. Teacher		
D. Shop Policy	Lecture To acquaint students with rules and regulations concerning all phases of laboratory or shop related activities	Read, sign and retain required shop rules and regulations forms	B-5 B-6 B-7 B-8

INTRODUCTION

BLOCK TWO

A. History of Automotive Construction and Design

B. Importance of the Auto Body Technician to Modern Society

C. Nomenclature, Use, Care, Maintenance, and Safety Involved With Hand Tools

D. Nomenclature, Uses, Care, Maintenance, and Safety Involved With Power Tools

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. History of Automotive Construction and Design	Lecture Automobile evolution emphasizing engineering improvements in design technology and how they affected present day automobiles a. Body b. Frame c. Drive train d. Suspension e. Glass f. Unholstery and trim g. Accessories h. Safety regulations	The student will conduct individual research and report to the class on an assigned topic concerning the history of the automobile	A-10 A-11 A-12 A-13 A-14 A-15 A-16 A-17 A-18 A-19 A-20 E-9 F-9 F-10 H-1
B. Importance of the Autobody Technician to Modern Society	Lecture a. Public mobility b. Restore valve of damaged unit c. Maintain pride of ownership	Prepare a two-page report on the importance of the autobody technician to modern society	A-21 A-22 A-23 A-24 A-25
C. Nomenclature, Use, Care, Maintenance, and Safety Involved With Hand Tools	Lecture and Appropriate Demonstration a. Hammers b. Dollies c. Pick tools d. Files e. Filler applicators f. Pliers and clamps g. Wrench and socket sets h. Screwdrivers i. Chisels j. Special tools	Identify and explain the use of all indicated hand tools stressing the safety precautions to be observed while using each one	A-26 C-1

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
D. Nomenclature, Uses, Care, Maintenance, and Safety Involved With Power Tools	Lecture and Appropriate Demonstration a. Sanders b. Grinders c. Polisher and buffer d. Drills e. Impact tools and air lines f. Jacks and other hydraulic tools g. Vacuum cleaner h. Saws i. Special tools j. Safety precautions	Identify and explain the use of all indicated power tools stressing the safety precautions to be observed while using each one Satisfactorily complete a written safety test	A-27 A-28 C-1

WELDING AND CUTTING

BLOCK THREE

A. Introduction to Welding and Cutting

B. Hazards and Safety

C. Oxy-acetylene

D. Arc Welding

E. Spot Welding

F. Inert Gas

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. Introduction to Welding and Cutting	Lecture and Appropriate Demonstration To acquaint the student with a need for welding competency a. Jointing stationary body parts b. Repairing metal c. Cutting metal	The student will read and retain copies of material handed out in class and prepare a two-page report on the history of welding	B-6 B-9 B-10 D-1 E-2 E-9 H-1
B. Hazards and Safety	Lecture and Appropriate Demonstration To impress upon the student the importance of safety a. Cleanliness of shop b. Use of shields and goggles c. Handling hot metal d. Checking equipment before use e. Project welding and cutting safety f. Danger of horseplay g. Storage of equipment h. Protective clothing	Satisfactorily complete a written safety test	B-6 E-3
C. Oxy-acetylene	Lecture and Appropriate Demonstration To stress skills necessary with oxy-acetylene welding: a. Use and care of oxy-acetylene equipment and related materials b. Setting up equipment, adjusting gauges, checking for leaks	Demonstrate proper equipment set up and leak check	B-11 B-12 B-13 D-2

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
C. Oxy-Acetylene (continued)	Lecture and Appropriate Demonstration (continued) c. Proper flame adjustment	Practice and demonstrate proper flame adjustments	
	d. Welding and brazing techniques	Practice and complete assigned exercises on metal of various thickness	
	e. Cutting and heating techniques	Practice and complete assigned exercises	
	f. Safety precautions	Demonstrate all applicable safety precautions	
D. Arc Welding	Lecture and Appropriate Demonstration To acquaint the student with advantages and uses of the arc welder:		D-3 E-1 F-11
	a. Operation and care of arc welding equipment	Demonstrate operation of equipment	
	b. Electrodes	Identify and select various assigned electrodes	
	c. Heat ranges	Practice and demonstrate selection and use of heat ranges for each assigned task	
	d. Prevention and control of distortion	Complete assigned exercises on metal of various thickness	
	e. Safety precautions	Demonstrate all applicable safety precautions	
E. Spot Welding	Lecture and Appropriate Demonstration The need for spot welding:		C-4
	a. Preparation of metal	Assigned exercises	
	b. Proper adjustment of equipment	Demonstrate proper adjustment and use of equipment	

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
E. Spot Welding (continued)	Lecture and Appropriate Demonstration (continued) c. Safety precautions	Demonstrate all applicable safety precautions	
F. Inert Gas	Lecture and Appropriate Demonstration To acquaint the student with the application and advantages of inert gas welding:		C-5
	a. Types of welders	Identify and demonstrate types of equipment	
	b. Tips, electrodes, and filler material	Identify and demonstrate the use of various tips, electrodes, and filler material on various metal types	
	c. Gases	Identify and use various gases as required	
	d. Safety precautions	Complete all assigned exercises observing applicable safety precautions	

TECHNIQUES OF SHAPING METAL

BLOCK FOUR

A. Introduction and Safety

B. Analysis of Damage

C. Selection of Tools

D. Alignment of Damage

E. Picking and Filing

F. Shrinking Metal

G. Metal Finishing

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. Introduction and Safety	Lecture and Appropriate Demonstration To familiarize the student with techniques of shaping metal: a. Proper cleaning of surface b. Proper straightening procedure c. Safety precautions	The student will complete a written test on techniques utilized in shaping metal	A-29 B-14 B-15
B. Analysis of Damage	Lecture and Appropriate Demonstration To emphasize the importance of proper damage analysis: a. Impact areas b. Types of damage	Practice and demonstrate various damage analysis utilizing various damaged vehicles and component parts such as hoods, deck lids, and panels located in the shop	C-1 E-2 E-3 E-4 E-5
C. Selection of Tools	Lecture and Appropriate Demonstration To emphasize proper selection of tools for various types of damage: a. For raising low spots b. For removing deep bends c. For flattening high spots d. For shrinking stretched metal e. Other tools applicable to the job	Practice selection and use of tools covering assigned exercises as a damaged door assembly which could require attention in each of the areas a through e of this unit	E-9 H-1

TECHNIQUES OF SHAPING METAL:
(continued)

Block No. 4

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
D. Alignment of Damage	Lecture and Appropriate Demonstration To acquaint student with proper alignment procedures: a. Establish dimensions b. Straightening sequence c. Correct use of power equipment d. Relieve tension and stress e. Roughing out f. Safety precautions	Practice assigned exercises demonstrating each procedure satisfactorily before being allowed to progress to the next stage (unit). Note: The task could be alignment of hood and fender damage or other appropriate exercise	
E. Picking and Filing	Lecture and Appropriate Demonstration To emphasize proper methods involved: a. Techniques of using the picking tools b. Proper techniques of using the vixen file c. Safety precautions	Practice assigned exercises until proficient in the process and able to demonstrate the procedure to the instructor and other members of the class. Note: The task could be a continuation of the previous unit involving hood and fender damage	
F. Shrinking Metal	Lecture and Appropriate Demonstration To emphasize proper shrinking methods: a. Methods of shrinking b. Special shrinking hammer c. Heat d. Safety precautions	Practice assigned exercises until proficient in the process. This proficiency must be demonstrated satisfactorily using appropriate equipment such as: a. Oxy-acetylene torch with proper tip and heat range b. Shrinking hammer and dollies c. Related materials	

CHNIQUES OF SHAPING METAL:
(continued)

Block No. 4.

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
G. Metal Finishing	Lecture and Appropriate Demonstration To emphasize proper methods of metal finishing and safety: a. Safety precautions b. Attaching grinding disc c. Techniques of grinding	Practice assigned exercises until proficient in the process. Demonstrate proper tool selection for the task and observe all safety precautions. Note: The task could be finishing damage to a quarter panel assembly requiring the proper selection of the following: a. Disc sander b. Orbital disc sander c. Orbital flat sander d. Proper RPM (if applicable) e. Proper grit selection f. Proper tool angle g. Proper tool movement h. Featheredging technique	

BODY FILLER AND FIBERGLASS REPAIRS

BLOCK FIVE

A. Introduction and Safety

B. Body Solder

C. Plastic Filler

D. Fiberglass Repairs

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. Introduction and Safety	Lecture To introduce different types of body filler and safety precautions involved in their use	The student will conduct individual research and report to the class on various fillers available and why they are preferred types as to advantages and ease of use	B-6 E-9 H-1
B. Body Solder	Lecture and Appropriate Demonstration To introduce the student to the correct application of body solder: a. Tools and material b. Metal preparation c. Techniques of application	Practice different types of repairs as utilizing lead to cover the joining of stationary panels a. Safety precautions b. Proper tool selection c. Preparation of metal d. Lead application e. Metal finishing	
C. Plastic Filler	Lecture and Appropriate Demonstration To introduce the student to the correct application of plastic filler: a. Tools and material b. Metal preparation c. Techniques of application d. Finish sanding	Practice and demonstrate the correct techniques of applying shaping and sanding plastic filler as may be required in repair of door damage for example a. Safety precautions b. Proper tool selection c. Proper material selection d. Proper metal preparation e. Application of filler f. Removal of excess material g. Application of additional filler (if needed) h. Complete shaping i. Finish sanding Note: This process must be satisfactorily demonstrated before student is allowed to progress to the next unit	C-1

BODY FILLER AND FIBERGLASS REPAIR: (continued)

Block No. 5.

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
D. Fiberglass Repairs	Lecture and Appropriate Demonstration To introduce the student to different methods of fiberglass repair a. Repairing holes in panels b. Repairing split or cracked panels c. Panel replacement	Practice different methods of fiberglass repair by completing assigned exercises. An example could be a split or cracked body panel requiring: a. Analysis of damage b. Determining best repair method c. Removal of deteriorated material (if necessary) d. Preparation of all surfaces e. Use of bonding strips f. Build up of area g. Curing time h. Application of plastic filler i. Shaping of affected area j. Finish sanding procedure	B-16 E-6 F-12

BODY AND FRAME

BLOCK SIX

A. Introduction

B. Types of Body and Frame Construction

C. Types of Equipment

D. Analysis of Damage

E. Measurement and Dimensions

F. Align Frame and Body

G. Suspension

H. Wheel Alignment

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. Introduction and Safety	Lecture and Appropriate Demonstration To provide a basic understanding of automobile construction and introduce different models and styles: a. Two and four door sedans b. Hard top c. Convertible d. Station wagon e. Safety features	Identify and explain various design techniques used by manufacturers through completion of individual research and report to the class	E-7 E-9 H-1
B. Types of Body and Frame Construction	Lecture and Appropriate Demonstration To familiarize the student with the types of body and frame construction: a. Body and frame b. Unitized body c. Stub frame and body	Observe and identify the types of body and frame construction, demonstrating his understanding of each unit to the instructor and other class members. Various cut-a-way sections and other applicable units may be utilized in this demonstration	J-2 J-3
C. Types of Equipment	Lecture and Appropriate Demonstration To familiarize the student with various equipment available: a. Stationary b. Portable	Demonstrate proper use and safety precautions pertaining to all indicated equipment available such as: a. Frame machine b. Damage dozer c. Measuring instruments d. Remote controlled jacking equipment e. Other applicable equipment	J-2

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
D. Analysis of Damage	Lecture and Appropriate Demonstration To acquaint the student with the procedures utilized in determining the type of damage: a. Diamond b. Twist c. Mash d. Sag e. Side sway	Demonstrate ability to analyze each type of damage, a through e, by actually setting up equipment and utilizing either a damaged vehicle or shop test vehicle for analysis. Note: This process must be satisfactorily demonstrated before the student is allowed to progress to the next unit	H-1
E. Measurement and Dimensions	Lecture and Appropriate Demonstration To explain to the student procedure followed in using tramming gauges to check frame for the following damage: a. Diamond b. Twist c. Mash d. Sag e. Side sway Check body openings: a. Windshield b. Door c. Trunk lid d. Back window	Utilize trammel equipment to correctly demonstrate to the instructor and other class members proper damage analysis of each type indicated in a through e. Each body opening area must be systematically checked during this exercise. Note: This process must be satisfactorily demonstrated before the student is allowed to progress to the next unit	B-17

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
F. Align Frame and Body	Lecture and Appropriate Demonstration To introduce the student to proper procedures and safety involved in alignment of all body and frame types. Correct the following frame damage: a. Diamond b. Twist c. Mash d. Sag e. Side sway	Successfully demonstrate each procedure indicated in a through e by proper set up of equipment and simulated alignment procedure while observing all applicable safety precautions. Note: One or more of these areas must be actually demonstrated on a damaged vehicle at the direction of the instructor	I-3
	Align: a. Cowl panel b. Windshield opening c. Door opening d. Top panel e. Rear compartment panel f. Center pillar post g. Front hinge pillar h. Floor assembly	Demonstrate each procedure indicated in a through h by proper set up of equipment and simulated alignment procedure while observing all applicable safety precautions. Note: One or more of these areas must be actually demonstrated on a damaged vehicle at the direction of the instructor.	
G. Suspension	Lecture and Appropriate Demonstration To introduce the student to identification and operation of component parts: a. Nomenclature b. Purpose c. Operating principal d. Maintenance e. Safety precautions	Identify and explain total function of each component part using test vehicles or cut-a-way units as available in the shop	A-30 A-31 B-17

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
H. Wheel Alignment	Lecture and Appropriate Demonstration To introduce the process of wheel alignment: a. Caster b. Camber c. Toe in d. Steering axis inclination e. Turning radius f. Method of adjustment g. Types of equipment available	Practice checking and alignment of assigned vehicles including: a. American Motors products b. Chrysler products c. Ford Motor Company products d. General Motors products e. Vehicles of foreign manufacture f. Others as may be readily available	I-1 I-2 I-3

REMOVING AND REPLACING OF DAMAGED PARTS

BLOCK SEVEN

A. Introduction

B. Body Shell

C. Doors and Deck Lids

D. Front End Sheet Metal

E. Bumper and Trim

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. Introduction and Safety	Lecture To acquaint the student with the procedure for safe removal and replacement of parts		E-2 E-7 E-9 H-1
B. Body Shell	Lecture and Appropriate Demonstration To acquaint the student with the process of removal and replacement of damaged parts: a. Basic construction b. Removal and installation procedure c. Method of removal d. Method of replacement e. Safety factors involved	Complete all assigned exercises demonstrating all applicable safety precautions, an example of which may be removal and successful replacement of roof or top panel assembly by: a. Checking appropriate service manual and alignment of body shell (as by triangulation) b. Analysis of removal procedure and tool selection c. Removal of related components d. Removal of unit e. Alignment of replacement unit f. Clamping g. Welding procedure (tack and cheek openings) h. Final alignment check and complete welding i. Grinding j. Inspection of openings k. Replacement of related components l. Final inspection	A-32 B-18 B-19 B-22

REMOVING AND REPLACING OD DAMAGED PARTS: (continued)

Block No. 7

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
C. Doors and Deck Lids	Lecture and Appropriate Demonstration To acquaint students with the process of removing and installing door and deck lids: a. Method of attachment b. Removal and installation procedure c. Removal and replacement of damaged parts d. Types of adjustment e. Alignment of parts f. Uses of special tools	Complete all assigned exercises, demonstrating all applicable safety precautions, as removal of door assembly by: a Reading appropriate service manual section b. Analysis of removal procedure and tool selection c. Removal of unit d. Inspection of opening (and necessary repair) e. Position and install replacement unit f. Check alignment and operation g. Adjust as indicated h. Final inspection	B-20 B-21 B-23
D. Front End Sheet Metal	Lecture and Appropriate Demonstration To acquaint student with removal and installing front end sheet metal: a. Method of attachment b. Removal and installation procedure c. Removal of damaged parts d. Installation of replacement parts e. Alignment and adjustment	Complete assigned exercises demonstrating all applicable safety precautions and use of service manuals for removal and replacement of: a. Fender assemblies b. Grill assemblies c. Hood assemblies d. Stone deflector assemblies e. Other applicable units or exercises as may appear appropriate	J-4 J-5

REMOVING AND REPLACING OF DAMAGED PARTS: (continued) Block No. 7.

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
E. Bumper and Trim	Lecture To acquaint student with removal and installing bumpers and trim: a. Method of attachment b. Removal and installation procedure c. Removal of damaged parts d. Replacing parts e. Alignment f. Use of special tools	Complete all assigned exercises demonstrating all applicable safety precautions and use of service manuals for removal and replacement of: a. Front bumper assemblies b. Rear bumper assemblies c. All trim components	

BASIC AUTOMOTIVE ELECTRICITY

BLOCK EIGHT

A. Introduction

B. Wiring Diagram Interpretation

C. Component Parts

D. Trouble Shooting

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UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. Introduction and Safety	Lecture and Appropriate Demonstration To introduce students to basic automotive electricity and safety hazards	The student will complete individual research and report to the class on assigned topics relating to electrical theory, analysis and safety	E-9 G-1 H-1 J-4 J-5 J-6 J-7
B. Wiring Diagram Interpretation	Lecture and Appropriate Demonstration To acquaint students with wiring systems and wiring diagrams a. Diagram reading procedure (Schematic)	Demonstrate proper selection and utilization of appropriate service manual to cover each component likely to be rendered inoperative as a result of collision	A-33 G-1 J-6 J-7
C. Component Parts	Lecture To acquaint the student with the basic components of the electrical system a. Battery (polarity) b. Alternator or generator c. Wiring harness d. Circuit breakers and fuses e. Switches f. Sockets, bulbs and terminals g. Printed circuits	Perform assigned exercises in removal, inspection and replacement of electrical components as: a. Battery and related cables b. Alternator and current regulator c. Generator and current regulator d. Various segments of all wiring harness of a typical vehicle e. Switches, fuses, circuit breakers, terminals, plugs and receptacles, bulbs and sockets f. Printed circuits g. Other appropriate related items or components as may be assigned	G-1 J-4 J-5 J-6 J-7

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
D. Trouble Shooting	Lecture and Appropriate Demonstration To acquaint the student with the correct sequence for trouble shooting the electrical system following damage: a. Current source b. Short circuits c. Damaged components d. Grounding	Demonstrate correct sequence in trouble shooting types of electrical system damage and proper use of test equipment such as: a. Utilization of the VOM (voltohm meter) b. Induction ammeter c. Polarity tester d. Hydrometer (battery) e. Battery tester/charger f. Continuity tester g. Other test equipment as may be appropriate or available in the shop	G-1 J-4 J-5 J-6 J-7

UPHOLSTERY AND GLASS

BLOCK NINE

A. Introduction

B. Special Equipment

C. Windshield and Back Glass

D. Upholstery and Interior Trim

E. Door and Quarter Glass

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. Introduction and Safety	Lecture To acquaint the student with safe methods employed in working with upholstery and glass	The student will complete individual research and a two-page paper on the history of automotive upholstery and glass, improvements, and safety involved	E-2 E-3 E-7 E-9 H-1
B. Special Equipment	Lecture and Appropriate Demonstration To acquaint the student with special equipment utilized in this area: a. Electric knife b. Piano wire c. Special cutting knife d. Moulding clip removal tool e. Caulking gun f. Allen wrench set g. Nylon cord h. Door handle tools	Practice and demonstrate the proper use of all equipment indicated in a through h while completing assigned exercises observing all applicable safety precautions	B-23 E-2 E-3 E-7 J-4 J-5
C. Windshield and Back Glass	Lecture and Appropriate Demonstration To acquaint the student with the procedures involved in the removal and installation of windshield and back glass: a. Types of installations b. Procedures c. Clean up d. Safety and handling	Practice and demonstrate assigned exercises while observing all applicable safety precautions by: a. Removal and installation of two windshields b. Removal and installation of two back glasses c. Utilization of proper service manual d. Proper sealing e. Proper clean up	B-23 B-24 E-2 E-3 E-7 J-4 J-5 J-7

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
D. Upholstery and Interior Trim	Lecture and Appropriate Demonstration To acquaint the student with the proper procedure for removal and replacement of upholstery and interior trim a. Safety and need for careful handling of lining trim and hardware items b. Procedure of headliner removal and replacement c. Types of attachments d. Procedure for removing and reinstalling interior trim panels	Practice and demonstrate assigned exercises while observing all applicable safety precautions by: a. Removal of all upholstery and interior trim from at least one vehicle using proper tools and service information b. Correct installation of all upholstery and interior trim on the same vehicle such that it will pass inspection	B-23 B-24 E-2 E-3 E-7 J-4 J-5 J-7
E. Door and Quarter Glass	Lecture and Appropriate Demonstration To familiarize the student with process involved in the replacement of glass and component parts a. Procedures for removal and installation of door glass and quarter glass b. Regulators, channels and adjustments c. Lubrication d. Power windows	Practice and demonstrate assigned exercises while observing all applicable safety precautions by: a. Selection of appropriate service manual and tools b. Removal of door glass from three different door types c. Inspection, cleaning, repair and lubrication of regulators and channels d. Installation of door glass and proper adjustment e. Trouble-shoot a typical power window assembly f. Proper clean up and inspection	B-23 B-24 E-2 E-3 E-7 J-4 J-5 J-7

REFINISHING

BLOCK TEN

A. Introduction and Safety

B. Spray Painting Equipment

C. Cleaning

D. Sanding

E. Masking

F. Undercoats

G. Painting

H. Compound and Polish

I. Final Assembly

J. Clean Up and Polish

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
A. Introduction and Safety	Lecture and Appropriate Demonstration To familiarize the student with the art of modern automobile refinishing a. Shop rules and regulations pertaining to safety in the refinishing department b. Federal, state and local regulations	The student will demonstrate a total understanding of all safety precautions and rules involving use of all refinishing equipment in the laboratory	A-33 A-34 A-35 A-46 E-9 H-1
B. Spray Painting Equipment	Lecture and Appropriate Demonstration To stress the nomenclature, use, care and maintenance of spray equipment a. Source of air supply b. Air regulator c. Hose d. Spray gun	Practice and demonstrate the proper use and care of all equipment while observing all applicable safety precautions such as: a. Servicing air compressor b. Servicing air regulator c. Checking and care of air lines, hoses and fittings d. Disassembly, cleaning, inspection, servicing, reassembly, and testing of spray gun	A-36 A-37 A-38 A-39 A-40 A-41
C. Cleaning	Lecture and Appropriate Demonstration To impress upon the student the value and relationship of cleaning to a quality refinished product a. Proper use of cleaning solvents b. Safety in the use of cleaning solvents	Practice and demonstrate assigned exercises while observing all applicable safety precautions by: a. Selection and use of solvents for assigned exercise b. Reference to paint manufacturer's specifications c. Technique of utilization and safety	G-2

REFINISHING: (continued)

Block 10

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
D. Sanding	Lecture and Appropriate Demonstration To impress upon the student the value of proper sanding to a quality refinished product a. Use of equipment b. Types of abrasives c. Abrasive grit sizes d. Techniques of sanding e. Clean up	Practice and demonstrate assigned exercises while observing all applicable safety precautions by: a. Selection of equipment b. Selection of reference material c. Choice of abrasive d. Grit selection e. Technique of procedure f. Inspection technique g. Featheredging technique h. Clean up procedure	A-42 A-45 G-2
E. Masking	Lecture and Appropriate Demonstration To impress upon the student the value of careful masking to a quality refinished product a. Precautions b. Trim and hardware c. Mouldings d. Glass e. Panels f. Upholstery g. Lights h. Wheels i. Antenna	Practice and demonstrate assigned exercises by: a. Removal of all possible components b. Tape and paper selection c. Technique of applying tape and masking material to areas indicated in a through i	J-8 J-9 F-13 G-2

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
F. Undercoats	Lecture and Appropriate Demonstration To impress upon the student the proper selection and use of undercoats to improve the overall appearance of the final finish a. Purpose and safety b. Lacquer-type primer surfacer c. Synthetic primer surfacer d. Putty e. Sealer f. Application	Practice and demonstrate assigned exercises while observing all applicable safety precautions by: a. Selection of reference material and mixing data b. Selection of primer type for each given exercise c. Selection of gun d. Gun and pressure setting for application e. Selection of putty and its application (where necessary) F. Selection of sealer and its application g. Clean up of equipment and shop area	G-2
G. Painting	Lecture and Appropriate Demonstration To impress upon the student the necessity of a quality final finish a. Handling of paints and materials b. Variables affecting painting c. Cleanliness of paint area and project d. Application of acrylic lacquer e. Application of snythetic enamel f. Application of acrylic enamel	Demonstrate overall familiarity with and use of different materials discussed by completing assigned exercised indicated in a through g. Actual painting to include various component parts such as: a. Door assemblies b. Deck lids c. Hood assemblies d. Body panels e. Other appropriate assemblies and the total refinishing of an assigned number of vehicles following all indicated procedures and techniques as demonstrated and discussed in class.	A-43 A-44 B-25 B-26 B-27 G-2

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
G. Painting (continued)	Lecture and Appropriate Demonstration g. Application of special finishes		
H. Compound and Polish	Lecture and Appropriate Demonstration To explain to the student processes employed for improving luster of final finish a. Types of compounds and polishes b. Uses c. Methods of application d. Final clean up	Practice and demonstrate assigned exercises utilizing the various available compounds and polishes by: a. Proper material selection and reference to the manufacturer's specifications b. Proper tool selection c. Proper technique of application d. Determining proper degree of luster possible e. Proper clean up procedures	G-2
I. Final Assembly	Lecture and Appropriate Demonstration To impress upon the student the process of preparing a car for final delivery by proper replacement of: a. Bumpers b. Mouldings c. Headlight doors d. Hardware and trim	Practice and demonstrate assigned exercises by: a. Polishing of bumpers b. Care in installing bumper assemblies c. Polishing all other bright hardware and trim d. Displaying extreme care and caution while reinstalling all remaining trim and component parts removed for painting e. Checking the operation of all systems of the vehicle f. Overall inspection	B-28

UNITS OF INSTRUCTION	INFORMATION	STUDENT ACTIVITIES	INSTRUCTIONAL AIDS
J. Clean Up Polish	Lecture and Appropriate Demonstration To explain to the student the value and purpose of final clean up and polish a. Products employed b. Use of products c. Application	Practice and demonstrate assigned exercises through final clean up of all vehicles on which work has been completed by: a. Interior cleaning b. Exterior cleaning c. Glass and mirror cleaning d. Cleaning tires e. Final polishing of bright work as chrome areas	

SHOP MANAGEMENT

BLOCK ELEVEN

A. Introduction and Safety

B. Management

C. Estimating

D. Shop Lay-out

Units of Instruction	Information	Student Activities	Instructional Aids
A. Introduction and Safety	Lecture		A-51 A-52 A-53 A-54 A-56 E-9 H-1
B. Management	Lecture a. Human relations b. Business bookeeping c. Purchasing d. Ethics	Demonstrate assigned simulated situations involving management as indicated in a through d	A-47 A-48 A-49 A-50 E-8 F-13
C. Estimating	Lecture a. Shop related math b. Estimate inspection and sequence	Complete all assigned exercises involving actual job estimates to be compared with final actual repair cost	A-55 A-57
D. Shop Lay-out	Lecture	Design what is considered the ideal autobody facility including as much detail and research as is appropriate	

APPENDIXES

Materials such as teaching guides, aids, information sheets and other forms are supplied only as examples. Those involved in developing this guide believe that these examples will be helpful.

APPENDIX A

INSTRUCTIONAL MATERIALS

FOR AUTOBODY REPAIR

CODE BREAKDOWN

FOR ALL INSTRUCTIONAL MATERIAL

REFERRED TO IN THIS GUIDE

A) 16mm Films

B) Filmstrips

C) Transparencies

D) Film Loops

E) Books

F) Pamphlets and Booklets

G) Service Bulletin

H) Slides

I) Wall Charts

J) Manuals

All items included in the appendix as a suggested example are arranged according to code letter as indicated in the above list. In order to facilitate location of these items in the appendix, they are followed by a number indicating exact position.

REFERENCES FOR INSTRUCTIONAL AIDS

16mm Motion Pictures (Sound and Color)

A-1 Wonderful World Of Wheels
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 18 minutes. Newest techniques in repairing both lacquer and enamel metallic finishes with Lucite Acrylic Lacquer.

A-2 A Real Spectacular
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 12 minutes. Dramatizes the size of the Refinish Market and the car dealer's need to meet it. Shows how large the paint and body shop business is, and how important this service function is to any successful car dealer or collision shop.

A-3 Slips and Falls
Source: C & P Telephone, 703 East Grace Street, Richmond, Virginia 23219. 10 1/2 minutes. Hazards encountered at home and at work.

A-4 Best Foot Forward
Source: Modern Talking Picture Service, 2000 1 Street, S. W., Washington, D. C. 20036. 18 minutes. Hazards to a careless worker.

A-5 No Accident
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 20 minutes.

A-6 Safety First-Second-Third
Source: General Motors Corporation, Public Relations Staff, Film Library, General Motors Building, Detroit, Michigan 48202. 20 minutes.

A-7 Destination Safety
Source: General Motors Corporation, Public Relations Staff, Film Library, General Motors Building, Detroit, Michigan 48202. 18 minutes.

A-8 Let's Live A Little Longer
Source: General Motors Corporation, Public Relations Staff, Film Library, General Motors Building, Detroit, Michigan 48202. 17 minutes.

A-9 Analysis Of A Bulk Plant
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 25 minutes. Fighting a fire.

A-10 The Body Builders
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 26 1/2 minutes. Creation of a car by Fisher.

A-11 Formula Ford
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 23 minutes.

A-12 Changing Architecture Of The Automobile Body
Source: General Motors Corporation, Public Relations Staff, Film Library, General Motors Building, Detroit, Michigan 48202. 18 minutes.

REFERENCES FOR INSTRUCTIONAL AIDS

16mm Motion Pictures (Sound and Color)
(continued)

A-13 A Car Is Born
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 23 minutes.

A-14 The World Of Henry Ford
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 20 minutes.

A-15 Where It's At
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 23 minutes. Story of Volkswagen in Germany.

A-16 Why Man Creates
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 25 minutes. Man's ability to achieve.

A-17 The New Bethlehem Steel
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 20 minutes. Tour of a steel plant in operation.

A-18 Year 1999 A.D.
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 20 minutes.

A-19 So You Want To Buy A Used Car
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 18 minutes.

A-20 What A Way To Go
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 27 1/2 minutes. History of auto industry.

A-21 Your Car In Motion
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 18 minutes.

A-22 No Margin For Error
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 28 minutes.

A-23 The Design Makers
Source: Ford Film Library, The American Road, Dearborn, Michigan 48121. 22 minutes.

A-24 Threshold Of Tomorrow
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 21 minutes. Challenges in industry.

A-25 The Hero
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 10 minutes. Dramatizes the size of the Refinish Market and the car dealer's need to meet it.

A-26 ABC Of Hand Tools
Source: General Motors Corporation, Public Relations Staff, Film Library, General Motors Building, Detroit, Michigan 48202. 18 minutes.

REFERENCES FOR INSTRUCTIONAL AIDS

16mm Motion Pictures (Sound and Color) (continued)

A-27 Playing It Safe With Power Tools
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 14 minutes. Safety procedures that should be employed.

A-28 Automobile - The Great Love Affair
Source: McGraw-Hill Textfilms, 330 West 42nd Street, New York, New York 10036. 27 minutes.

A-29 This Is Steel
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 33 minutes.

A-30 The Noble Breed
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 28 minutes. Tire service.

A-31 Reaction, Brakes, Time, and Space
Source: Bureau of Teaching Materials, Virginia State Department of Education, Richmond, Virginia 23216. 9 minutes. Graphic proof that tailgating is ridiculous.

A-32 Whiplash
Source: Bureau of Teaching Materials, Virginia State Department of Education, Richmond, Virginia 23216. Study of rear end collision.

A-33 Good Hand - Good Eye
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 20 minutes. A dramatic view of the opportunities in the Refinish Industry, as seen by a recently discharged soldier looking at a modern paint and body shop. Deals with the scope of the business, rather than products or systems.

A-34 Double Trouble
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 20 minutes. Basically entertaining, as it predates our current product offerings. Serves to emphasize the importance of using the right products in the right way.

A-35 It's A Different Story
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 22 minutes. Focuses on the importance of good shop conditions, equipment and spraying variables which affect spot, panel and overall refinishing. Illustrates difference in wet or dry spraying, highlighting techniques for matching colors in particular.

A-36 Color Is Your Business
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 18 minutes. Explains how important color is to the successful Refinish Shop. Demonstrates good spraying techniques and importance of using quality products properly.

A-37 Finish With A Future
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 20 minutes. The story on Lucite Acrylic Lacquer, giving it's superior advantages over the old Duco Lacquer.

REFERENCES FOR INSTRUCTIONAL AIDS

16mm Motion Pictures (Sound and Color)
(continued)

A-38 Same Story With A Difference
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 18 minutes. Techniques of spot repair of both acrylic lacquer and acrylic enamel with Lucite. Includes panel repairing, plus refinishing, plus refinishing with Dulux enamel.

A-39 Matching The Hard Ones
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 18 minutes. Newest techniques in repairing both lacquer and enamel metallic finishes with Lucite Acrylic Lacquer.

A-40 The Fantastic Fleet Finish
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 7 minutes. Illustrates superior advantages of using Imrou Polyurethane Enamel in truck work. Shows application procedures.

A-41 The Case Of The Impatient Painter
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 18 minutes. Shows fast drying benefits and application procedures for Centari Acrylic Enamel in both passenger car and truck refinishing.

A-42 50,000 Times A Day
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 12 minutes. Basically entertaining, as it pictures a Demolition Derby. Emphasizes potential of the Refinish market and includes basic repair steps.

A-43 Finish With A Future
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 18 minutes. The story of Lucite Acrylic Lacquer and its superior features over conventional lacquers.

A-44 Portraits In Color
Source: E. I. DuPont Company, 400 East 29th Street, Baltimore, Maryland 21218. 10 minutes. DuPont mixing service in the shop. Shows how to use DuPont's metric mixing system, emphasizing the advantages and cost savings.

A-45 Aluminum
Source: Modern Talking Picture Service, 2000 L Street, S. W., Washington, D. C. 20036. 28 1/2 minutes. From buxite to aluminum.

A-46 Danger - Poison
Source: Bureau of Teaching Materials, Virginia State Department of Education, 1969 Supplement, Richmond, Virginia 23216. 13 minutes. Use, identify and storage of dangerous products.

A-47 The Voice Of Your Business
Source: C & P Telephone, 703 East Grace Street, Richmond, Virginia 23219. 14 minutes. Good telephone habits.

A-48 Everyday Courage and Common Sense
Source: Bureau of Teaching Materials, Virginia State Department of Education, 1969 Supplement, Richmond, Virginia 23216. 11 minutes. Experiences in our lives which require courage, tempered by common sense.

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REFERENCES FOR INSTRUCTIONAL AIDS

16mm Motion Pictures (Sound and Color) (continued)

A-49 Creative Attitudes
Source: General Motors Corporation, Public Relations Staff, Film Library, General Motors Building, Detroit, Michigan 48202. 25 minutes.

A-50 Matter Of Responsibility
Source: General Motors Corporation, Public Relations Staff, Film Library, General Motors Building, Detroit, Michigan 48202. 20 minutes.

A-51 Your Job: Fitting In
Source: Bureau of Teaching Materials, Virginia State Department of Education, Richmond, Virginia 23216. 16 minutes. Actions of employees doing too little or too much and getting fired.

A-52 Your Job: Getting Ahead
Source: Bureau of Teaching Materials, Virginia State Department of Education, Richmond, Virginia 23216. 16 minutes. Experienced workers telling how to get ahead.

A-53 Your Job: You And Your Boss
Source: Bureau of Teaching Materials, Virginia State Department of Education, Richmond, Virginia 23216. 16 minutes. Relationship between worker and his boss.

A-54 Your Job: Good Work Habits
Source: Bureau of Teaching Materials, Virginia State Department of Education, Richmond, Virginia 23216. 13 1/2 minutes. Interviews with high school graduates on their first job.

A-55 Automobile Body Repairing Estimation
Source: U. S. National Audiovisual Center, National Archives and Research Service, Washington, D. C. 20409. 45 minutes.

A-56 Automobile Research Safety
Source: McGraw-Hill Textfilms, 330 West 42nd Street, New York, New York 10036. 26 minutes.

A-57 Automobiles - 2nd Edition
Source: Audio-Visual Center, Bloomington, Indiana 47401. 10 minutes.

Filmstrips

B-1 Safety Inspection
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 15 minutes.

B-2 Play Safe and Work Safe
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 15 minutes.

B-3 Maintaining A Safe Shop
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 15 minutes.

B-4 Training For Emergencies
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 18 minutes.

REFERENCES FOR INSTRUCTIONAL AIDS

Filmstrips
(continued)

B-5 Safety In Shops And Labs
Source: McGraw-Hill Book Company, New York. 15 minutes.

B-6 Eye Protection
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 17 minutes.

B-7 Treatment For Shock, Bleeding And Preventing Infection
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 18 minutes.

B-8 Aid For Injury, Fainting, Burns
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 20 minutes.

B-9 Introduction To Welding
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 20 minutes.

B-10 Oxy-acetylene Cutting
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 18 minutes.

B-11 Setting Up Lighting Welding Torch
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 20 minutes.

B-12 Brazing And Silver Soldering
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 20 minutes.

B-13 Fuel And Tank Repairs
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 18 minutes.

B-14 Quarter Panel Repair
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 15 minutes.

B-15 Fender Repair
Source: Jam Handy Organization, 2821 East Grand Boulevard, Detroit 11, Michigan. 17 minutes.

B-16 Repairing Fiberglass Bodies And Parts
Source: Ford Motor Company, Service Publications, Box 7750, Detroit, Michigan 48207. 20 minutes.

B-17 Servicing Steering Systems
Source: Ford Motor Company, Service Publications, Box 7750, Detroit, Michigan 48207. 18 minutes.

B-18 Weathering Sealing
Source: General Motors, Fisher Body Division, Service Section, General Motors Building, Detroit, Michigan 48202. 18 minutes.

B-19 Body Service
Source: Chrysler Corporation, Service Section, Box 2119, Detroit 31, Michigan. 18 minutes.

B-20 Wind Noise Technical Tips
Source: General Motors, Fisher Body Division, Service Section, General Motors Building, Detroit, Michigan 48202. 18 minutes.

REFERENCES FOR INSTRUCTIONAL AIDS

Filmstrips (continued)

B-21 Common Sense Body Sealing
Source: Chrysler Corporation, Service Section, Box 2119, Detroit 31, Michigan. 18 minutes.

B-22 Body Service Adjustments
Source: Chrysler Corporation, Service Section, Box 2119 Detroit 31, Michigan. 18 minutes.

B-23 Glass And Door Service
Source: Chrysler Corporation, Service Section, Box 2119, Detroit 31, Michigan. 18 minutes.

B-24 Windshield And Headlining
Source: Chrysler Corporation, Service Section, Box 2119, Detroit 31, Michigan. 18 minutes.

B-25 Painting Problems
Source: DuPont Refinish Division, E. I. DuPont and Company, Wilmington, Delaware 19898. 20 minutes.

B-26 Color Matching Metallic Paint
Source: Ford Motor Company, Service Publications, Box 7750, Detroit, Michigan 48207. 20 minutes.

B-27 Spot Repairing Original Finishes With Acrylic Lacquer
Source: Ford Motor Company, Service Publications, Box 7750, Detroit, Michigan 48207. 20 minutes.

B-28 Vinyl Roof Repair And Replacement
Source: Ford Motor Company, Service Publications, Box 7750, Detroit, Michigan 48207. 20 minutes.

Transparencies

C-1 Trainers Series - Automotive Refinishing
Source: Minnesota Mining and 3M Manufacturing Corporation, St. Paul, Minnesota. No. R-1.

C-2 Why Weld?
Source: DCA Educational Products Incorporated, 4865 Stenton Avenue, Philadelphia, Pennsylvania 19144.

C-3 Welder's Press
Source: DCA Educational Products Incorporated, 4865 Stenton Avenue, Philadelphia, Pennsylvania 19144.

C-4 Spot Welding
Source: DCA Educational Products Incorporated, 4865 Stenton Avenue, Philadelphia, Pennsylvania 19144.

C-5 Gas Tungsten ARC Welding (Tig) System
Source: DCA Educational Products Incorporated, 4865 Stenton Avenue, Philadelphia, Pennsylvania 19144.

Film Loops

D-1 An Introduction To Welding
Source: LATTA'S, J. S. Latta Incorporated, P. O. Box 1276, Huntington, West Virginia 25715.

D-2 Oxy-acetylene Welding
Source: LATTA'S, J. S. Latta Incorporated, P. O. Box 1276, Huntington, West Virginia 25715.

REFERENCES FOR INSTRUCTIONAL AIDS

Film Loops
(continued)

D-3 Basic Electric ARC Welding
Source: LATTA'S, J. S. Latta Incorporated, P. O. Box 1276, Huntington, West Virginia 25715.

Books

E-1 New Lessons In ARC Welding; 1965
Lincoln Electric Company
Cleveland 17, Ohio

E-2 The Principles Of Autobody Repairing And Repainting; 1971
Tait, Deroche, Hildebrand
Englewood Cliffs, New Jersey
Prentice-Hall Incorporated

E-3 Autobody Repair And Refinishing; 1969
Hogg, John W.
Canada
McGraw-Hill Company

E-4 Autobody Repairing And Refinishing; 1970
Drake Publishers
New York

E-5 The Principles Of Autobody Repair And Painting
Hildebrand, N. N.
Englewood Cliffs, New Jersey

E-6 Fiberglass Autobody Construction
Wills, John A.
D. R. Port Publications
Arradin, California

E-7 Autobody Repairing And Repainting; 1965
Toboldt, Bill
The Goodheart-Willcox Company, Incorporated
Homewood, Illinois

E-8 Shop Organization And Management; 1959
Weaver, Gilbert G.
Pitman Publishing Corporation
New York, New York

E-9 Collision Repair Guide
MacPherson
McGraw-Hill Book Company
New York

E-10 Handbook 21011, Vol. 6959L2
National Service Office
Ford Division
Dearborn, Michigan

Pamphlets and Booklets

F-1 The Opportunity Explosion; 1969
Snelling, Robert O.
Signet, Signet Classics, Signette, Mentor and Plum Books
New York

F-2 In Planning Your Future
General Motors Corporation MCMLXVI

REFERENCES FOR INSTRUCTIONAL AIDS

Pamphlets and Booklets
(continued)

F-3 What's In The Barrel For The Dropout?; Spring, 1969
U. S. Department of Labor, Bureau of Labor Statistics
Washington, D. C.

F-4 What Is An Education Worth?; December, 1968
U. S. Department of Labor, Bureau of Labor Statistics
Washington, D. C.

F-5 Job Opportunities In Automotive Service; February, 1966
U. S. Department of Labor, Bureau of Labor Statistics
Washington, D. C.

F-6 Apprenticeship Pays Dividends; August, 1969
Division of Apprenticeships, Department of Labor and Industry
Richmond, Virginia

F-7 Can I Be A Craftsman?
Public Relations Staff, General Motors
Detroit, Michigan

F-8 Labor Market Trends; a news letter, 1970
Virginia Employment Commission
Staunton and Waynesboro Commission

F-9 Metallurgy And Wheels; the story of men, metals, and motors
Technical Data Department, General Motors
Detroit, Michigan

F-10 The Story Of Fisher Body; 1969
Fisher Body Division, General Motors Corporation
Detroit, Michigan

F-11 Principles of Arc Welding
Miller Electric Manufacturing Company
Appleton, Wisconsin

F-12 Repairing Fiberglass
Unican Plastics Company, Incorporated

F-13 How To Get A Job; a handy guide for jobseekers
The President's Committee on Employment of the Handicapped
Washington, D. C.

F-14 3M Minnesota Mining and Manufacturing Company
St. Paul 19, Minnesota

Service Bulletins

G-1 Ford Technical Service Bulletin
Ford Customer Service Division
2550 East Grand Boulevard
Detroit, Michigan 48211

G-2 DuPont Refinisher News
E. I. DuPont de Nemours and Company, Incorporated
Refinishing Sales
Wilmington, Delaware 19898

Slides

H-1 Collision Repair Guide Slide Series
MacPherson
McGraw-Hill Book Company
New York

REFERENCES FOR INSTRUCTIONAL AIDS

Slides
(continued)

H-2 Collision Repair Guide Slide Series
MacPherson
McGraw-Hill Book Company
New York

Wall Charts

I-1 Bear Front End Specifications; passenger cars
Source: Bear Manufacturing Co., Rock Island, Illinois 61201

I-2 Bear Front End Specifications, trucks and bus
Source: Bear Manufacturing Co., Rock Island, Illinois 61201

I-3 Frame Chart
Source: Bear Manufacturing Co., Rock Island, Illinois 61201

Manuals

J-1 Accident Prevention Manual For Shop Teachers
Williams, William A.
American Technical Society
848 East 58th Street
Chicago, Illinois 60637

J-2 Coated Abrasives
Behr-Manning
Division of Norton Company
Troy, New York

J-3 Bear Manual
Bear Manufacturing Company

J-4 Service Manual
General Motors Corporation
Fisher Body Division
Detroit, Michigan

J-5 Car Shop Manual; 1970
Ford Motor Company
Dearborn, Michigan

J-6 Bulletin 216 (Electrical); page 6
U. S. Department of Labor
Department of Labor Statistics
Washington, D. C.

J-7 Motor Repair Manual; estimating manual
The Hearst Corporation
250 West 55th Street
New York, New York 10019

J-8 Automotive Refinishing Principles And Techniques; 1969
Hobson, W. T.
E. I. DuPont de Nemours and Company, Incorporated
Wilmington, Delaware

J-9 Ditzler Repaint Manual; 1969
Pittsburg Plate Glass
PPG Industries Incorporated
P. O. Box 5090 Seven Oaks Station
Detroit, Michigan

APPENDIX B

EXAMPLE OF A UNIT GUIDE

Block 10

UNIT GUIDE

COURSE Auto Body Repair

BLOCK 10

NAME OF UNIT Refinishing

UNIT OBJECTIVES

As a result of your teaching and student learning, your students

will understand:

1. Correct use of spray gun
2. Correct sanding procedures
3. Correct masking procedures
4. Selection of thinners and reducers
5. Types of paint

will be able to:

1. Operate spray gun
2. Sand complete car
3. Mask car
4. Spray undercoats
5. Spray topcoats

will:

1. Develop a good attitude toward safety
2. Appreciate good craftsmanship
3. Develop the ability to work harmoniously with fellow workers

R-1
Block 10
Unit A

LESSON BREAKDOWN

BLOCK NO. 10 TITLE Refinishing

Doing Lessons		Ref. Code	Knowing Lessons		Ref. Code
No.	How to:		No.	Technical Topics	
D8-1	Handling of spray gun	HOB pp.27-33	K8-1	Spray patterns	HOB p.30 VEN p.358
D8-2	Prepare surfaces	HOB p.45	K8-2	Sandpaper and sanding	VEN p.350 HOB p.18
D8-3	Apply protective coverings	VEN p.351	K8-3	Protective coverings	HOB p.12 MAC p.236
D8-4	Apply undercoats and glazing putty	HOB p.53	K8-4	Undercoats	HOB p.52 MAC p.228
D8-5	Apply color coats	HOB p.70	K8-5	Types of paint	HOB p.70 MAC p.205
D8-6	Final assembly		K8-6	Final assembly	
				General Topics	
			K8-7	Candy apply colors	
				Guidance Topics	
			K8-8	Your future in automotive refinishing field	

NOTE: Lessons are coded as follows:

1st (letter) D or K, doing or knowing lesson
2nd (numeral) unit number
3rd (numeral) lesson number in unit

EXAMPLE: D8-1 means: doing lesson, unit 8, number 1

Ref. Code refers to source for that particular lesson

TEACHING INGREDIENTS

1. References - Textbooks

Venk, Spicer, Davies
Automotive Collision Work
Third Edition, p. 346-380

Hobson, W. T.
Automotive Refinishing
E. I. DuPont de Nemours & Co.
p. 12-88

MacPherson, Robert C.
Collision Repair Guide
p. 205-236

2. Project-Activity Materials

12 gallons of paint
55 gallon drum thinner
2 cases masking tape
6 tubes glazing putty
7 packages sandpaper (40D, 80D, 220, 280, 320, 400, 600)
5 gallons prepsol
20 pounds rags
50 paint strainers
100 paint paddles

3. Demonstration Equipment

Spray gun
Spray gun wrench
Blow gun
1/4" socket set
Knife
Screwdriver set
Putty spreader
Putty knife
Air hose

4. Other Materials, Equipment

Film Projector
Film:
Good Hand, Good Eye
E. I. DuPont de Nemours & Co.
Refinishing Sales
Wilmington, Delaware

5. Resource Persons

DuPont field representative will give lecture on automotive paints.

Mr. Jimmy Brown will spray a vinyl roof and give a short lecture.

SUGGESTED METHOD OF APPROACH

The following method of approach for this course unit is suggestive only. However, if you have had little experience in teaching the content of this unit, it is advisable that you follow the approach in detail for your first teaching. As you gain experience, new ways to demonstrate and make information topics dynamic will come to you and these should be recorded in the spaces between the steps in the teaching approach. The teaching approach below will run from the first to the last day of the unit. You will have to decide how much to cover each day the class meets.

SUGGESTED TEACHER APPROACH	STUDENT ACTIVITY
1. Preliminaries (20 min.) A. Explain refinishing B. Announce new unit C. Appoint new foremen	A. Class assembly B. Students review new duties C. Questions
2. Spray Patterns (K8-1) (20 min.) A. Lecture - 15 minutes B. Information sheet Uneven spray patterns and their causes (k8-1-1)	A. Observe B. Select students to perform designated operations Activity A. Holding and operating gun B. Disassemble gun C. Cleaning of gun
3. How to Handle Spray Gun (D8-1) (20 minutes) A. Information sheet (D8-1-1) Gun break down B. Explain handling procedures	A. Observe B. Check information sheet C. Questions
4. Sandpaper and Sanding (K8-1) (20 minutes) A. Explain sandpaper grits B. Pass out examples C. Sanding procedures D. Sandpaper chart	A. Observe B. Check examples C. Questions
5. How to Prepare Surfaces (D8-2) (45 minutes) A. Explain surface conditions B. Job sheet - surface preparations (D8-2-1A)	Activity - 12 hours A. Prepare a car for sanding B. Rough sand surface C. Finish sand surface
6. Masking Procedures (K8-4) (25 minutes) A. Lecture - 15 minutes B. Question and answer period	A. Observe B. Respond to questions

(continued)

SUGGESTED TEACHER APPROACH	STUDENT ACTIVITY
7. How to Apply Protective Coverings (D8-3) two sessions - 30 minutes each A. Lecture - 15 minutes B. Show examples	A. Students check examples B. Discussion Activity - 8 hours A. Mask bumpers and mouldings B. Mask glass areas C. Mask complete car
8. How to Apply Protective Coverings #2 (D8-3) (45 minutes) A. 3M representative to give lecture on above B. Questions and answers C. Pass out examples	A. Observe B. Questions C. Check hand-outs Activity - 9 hours A. Mask emblems and nameplate B. Mask mouldings
9. Test on Above Unit (60 minutes)	Discussion Following Test
10. Undercoats and Putty (K8-4) (30 minutes) A. Lecture - 15 minutes B. Questions and answers	A. Students select correct undercoats for refinishing B. Questions
11. How to Apply Undercoats and Putty (D8-4) (45 minutes) A. Lecture - 30 minutes B. Undercoat chart	A. Observe B. Check chart C. Discussion Activity - 15 hours A. Students prime repaired areas B. Apply putty to low areas - Sand after dry C. Prime complete car
12. Four Types of Paint (K8-5) (30 minutes) A. Lecture - 15 minutes B. Show examples	A. Observe B. Check examples
13. Apply Color Coats (D8-5) (45 minutes) A. Movie: Good Hand, Good Eye B. Questions C. Operation sheet - Apply color coats (K8-5-1A)	A. Questions on movie Activity - 15 hours A. Practice spraying old car fenders and doors B. Paint one side of car with lacquer

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(continued)

SUGGESTED TEACHER APPROACH	STUDENT ACTIVITY
14. Apply Color Coats #2 (45 minutes) A. Lecture - 15 minutes B. Questions	A. Observe B. Discussion Activity - 15 hours A. Paint complete car with lacquer B. Buff and wax painted car
15. Refinishing Specialist (K8-7) (60 minutes)	Activity - 10 hours A. Same as 13
16. Field Trip to Local Ford Dealer (3 hours) A. Prepare students	A. Observe B. Give report Activity - 12 hours A. Same as 13 and 16
17. Administer Test on Color Coats (60 minutes)	Discussion after test
18. Candy Apple Paint (K8-6) (45 minutes) A. Information chart	A. Students observe B. Questions and answers Activity - 9 hours
19. Presentations by Mr. Jimmy Brown on Spraying of Vinyl Roofs	Question and answer period Activity - 9 hours
20. Unit Test (60 minutes)	Questions and discussion

INSTRUCTOR'S LESSON PLAN
Related Technical Information

INSTRUCTOR: Herley Blankenship

Block 10
Lesson K8-1

SUBJECT: Spray patterns

AIM (or purpose): Correct spraying patterns

TEACHING AIDS: Opaque Projector. Handout K8-3, 1, 2, 3, and 4

MATERIALS: Spray gun, paint can with directions

REFERENCES: DuPont Refinishing Guide

I. PREPARATION (of the learner)

1. The most important thing about a spray gun is the adjustments which regulate the spray patterns
2. You must know these patterns
3. You must know the type of paint which you are spraying

II. PRESENTATION (of the information)

Instructional Topics	Things to Remember To Do or Say
1. Material adjustment	A. Always check this adjustment B. Controls material to head
2. Pattern adjustment	A. Usually stays wide open B. Controls air to head of gun
3. Air regulators	A. Always check setting B. Drain air tank C. A change of air can cause problems
4. Paint directions	A. Always read labels on paint cans B. Too thin will cause runs C. Too thick will cause orange peel
5. Gun held at proper distance	A. About eight inches B. Even strokes C. Harmony in strokes
6. Gun breakdown	A. Give attention to disassembly B. Replace all worn gaskets
7. Questions	A. What is meant by material adjustment? B. What is a spray pattern? C. What is correct distance to hold a spray gun?

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III. APPLICATION (drills, illustrations, analogies, oral questions or assignments)

1. Check information sheet
2. Add information sheet
3. Questions and answers

TEST (final check on students' comprehension of material presented)

Test #2 on Friday

Suggested reading for student: p. 27-38, Automotive Refinishing

The next lesson is: sanding and sandpaper

INSTRUCTOR'S LESSON PLAN
Manipulative Skills

INSTRUCTOR: Herley Blankenship

Block 10
Lesson 1

JOB (or operation): Handling of spray gun

AIM (or purpose): How to operate and maintain a spray gun

TOOLS AND EQUIPMENT: Spray gun, gun wrench, cleaning brush, air hose, paint paddles, and cleaning pad

MATERIALS: Paint thinner and rags

TEACHING AIDS: Overhead projector and screen. Information sheet D8-1, 2 3, and 4

REFERENCES: Bink's Parts List, Automotive Collision Repair, and DuPont Refinishing Guide

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I. PREPARATION (of the learner)
   A. Personal experience
   B. A paint job is no better than the gun you use
   C. Importance of a clean gun

II. PRESENTATION (of the skills)

Operation or Steps	Key Points (things to remember to do or say)
1. Holding of gun	A. Grasping of gun and trigger B. Proper use of trigger
2. Paint material adjustment and air adjustment	A. Too much will cause sags and runs B. Too little will cause dry places C. Make certain head is clean D. Two types of spray heads
3. Disassembling gun	A. Gaskets and seats B. Check for loose couplings C. Check for worn parts
4. Cleaning gun	A. Do not put gaskets in cleaner B. Observe very carefully C. Clean all parts spotless D. Oil gun
5. Gun care	A. Never leave paint in gun B. Always keep gun off of the floor C. Do not drop gun D. Spray only thinners in gun

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Operation or Steps	Things to Remember To Do or Say
6. Ask questions	A. Two types of adjustments B. Main parts of gun C. Three things to avoid with gun D. Materials used to clean gun E. Places where gun should be oiled

III. APPLICATION (practice by learner under close supervision)

1. Select students to perform operation
2. Name parts as they are disassembled
3. Use thinner to practice trigger movement

TEST (performance of skill to acceptable standards)

1. Inspection of assigned work
2. Grades assigned and posted on progress chart
3. Test #1 on Friday

Suggested reading for student: p. 1-25, Bink's Guide Book

The next lesson is: surface preparations

INSTRUCTOR'S LESSON PLAN
Related Technical Information

INSTRUCTOR: Herley Blankenship

Block 10
Lesson K8-2

SUBJECT: Sanding and Sandpaper

AIM (or purpose): Will understand sanding procedures

TEACHING AIDS: Opaque projector, screen, pictures from DuPont Refinishing Guide

MATERIALS: 600, 400, 320, 280, 220 sandpaper (wet or dry)

REFERENCES: DuPont Refinishing Guide

I. PREPARATION (of the learner)

1. Correct way to hold sandpaper
2. Grit paper to use for a certain job
3. Correct sanding methods
4. Do not waste sandpaper
5. Do not sand moundings or glass

II. PRESENTATION (of the information)

Instructional Topics	Things to Remember To Do or Say
1. Sandpaper grades	A. Right grit for job B. Wet C. Dry
2. Preparation of surface	A. Remove wax B. Proper cleaner C. Dry surface
3. Sanding	A. Correct motion B. Not too long a stroke C. No shiny spots
4. Rough sanding	A. Grit of paper B. Feather-edge C. All scratches and nicks
5. Finish sanding	A. Feather-edge B. Just scuff primer C. Check for bare spots D. No shiny spots

Instructional Topics	Things To Remember To Do or Say
6. Short quiz	A. Five grits of sandpaper B. Two types or wax removers C. Stroke distance D. When to use wet or dry sandpaper E. What is the meaning of feather-edge?

III. APPLICATION (drills, illustrations, analogies, oral questions or assignments)

1. Make sandpaper chart
2. Check handouts of sandpaper

TEST (final check on students' comprehension of material presented)

Test #6 at end of lesson

Suggested reading for student: DuPont Refinishing Guide - sanding chapter

The next lesson is: correct masking procedures

INSTRUCTOR'S LESSON PLAN
Manipulative Skills

INSTRUCTOR: Herley Blankenship

Block 10
Lesson D8-2

JOB (or operation): Surface Preparation

AIM (or purpose): Prepare surface for refinishing

TOOLS AND EQUIPMENT: Blow gun, water hose

MATERIALS: Rags, prepsol, metal prep, primer

TEACHING AIDS: Preparation chart. DuPont

REFERENCES: Automotive Collision Repair, p. 353-355

I. PREPARATION (of the learner)

1. This step is important for a good paint job
2. Explain bare metal
3. Wax removal is important

II. PREPARATION (of the skills)

Operation or Steps	Things to Remember To Do or Say
1. Wash car with soap	A. Wash dirt from under fenders and mouldings B. Dry car off with chamois
2. Prepsol	A. Remove all tar and road film B. Dry off. Do not leave water spots.
3. Metal prep	A. Mix with water B. Use on all bare metal C. Let set for at least 10 min. D. Wipe off with wet rag
4. Check for rust under mouldings	A. Remove mouldings carefully B. Check for rust holes
5. Sanding	A. Sand scratches B. Sanding motion C. Sand complete car

III. APPLICATION (practice by learner under close supervision)

1. Select students to perform job
2. Use metal prep
3. Use prepsol
4. Check moulding for rust
5. Sand complete car

TEST (performance of skill to acceptable standards)

1. Check finished job
2. Put results on progress chart

Suggested reading for student: p. 353-355, Automotive Collision Repair

The next lesson is: protective coverings

INSTRUCTOR'S LESSON PLAN
Manipulative Skills

INSTRUCTOR: Herley Blankenship

Block 10
Lesson D8-3

SUBJECT (or operations): Masking Procedures

AIM (or purpose): Protect chrome and glass from paint

TOOLS AND EQUIPMENT: Blow gun, air hose, sharp knife

MATERIALS: Tape, paper

TEACHING AIDS:

REFERENCES: DuPont Refinishing Guide

I. PREPARATION (of the learner)

1. A good masking job is a must for a good paint job
2. Do not waste tape and masking paper
3. Practice craftsmanship

II. PRESENTATION (of the skills)

Operation or Steps	Things to Remember To Do or Say
1. Running tape on paper	A. Run tape half on and half off of paper B. Do not stretch tape
2. Masking of mouldings	A. Not on paint surface B. Cover all of mouldings C. How to run corners
3. Masking bumpers	A. Run tape first B. Tape all joints in paper
4. Masking windshield and other glass	A. Run single strip first B. Seal all joints in paper C. Cover all of glass
5. Masking door handles	A. Use tape only B. Use razor blade to trim C. Check for over-lap
6. Masking emblems	A. Use 1/4" tape B. No over-lap
7. Using paper machine	A. Correct pull angle B. Correct loading method

Operation or Steps	Things to Remember To Do or Say
8. Ask questions	A. What is meant by masking? B. Two methods of masking C. Types of masking tape D. Why mask off complete car when painting with enamel?

III. APPLICATION (practice by learner under close supervision)

1. Split students in four's
2. Mask complete car
3. Mask fenders and separate panels
4. Observe and give help

Test (performance of skill to acceptable standards)

1. Check finished job and grade
2. Put results on progress chart

Suggested reading for student: DuPont Refinishing Guide

The next lesson is: undercoats and glazing putty

INSTRUCTOR'S LESSON PLAN
Related Technical Information

INSTRUCTOR: Herley Blankenship

Block 10
Lesson K8-3

SUBJECT: Protective Coverings

AIM (or purpose): What to use to cover a certain part

TEACHING AIDS: Masking tape chart

MATERIALS: Masking tape (size 1/4, 1/2, 3/4, 1, and 2 inch). Plastic and newspapers

REFERENCES: 3M Masking Guide

I. PREPARATION (of the learner)

1. Masking is a must when preparing a car for painting
2. This procedure is important to make a professional looking job
3. Craftsmanship is very important

II. Presentation (of the information)

Instructional Topics	Things to Remember To Do or Say
1. Tape (1/4, 1/2, 3/4, 1, 2)	A. Use only when needed
2. Newspapers	A. Good for covering glass and bumpers B. Very inexpensive
3. Plastic or cloth	A. Over tops when painting bottoms B. Use when painting panels with enamel C. Seal all joints
4. Masking paper and machine	A. Very expensive, but saves time B. Seal all joints
5. Wheel covers	A. Always use to protect tires B. It's easier to put them on than to remove paint

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III. APPLICATION (drills, illustrations, analogies, oral questions or assignments)

1. Students check examples
2. Students name sizes of tapes

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TEST (final check on students' comprehension of material presented)

Test #7 on Wednesday

Suggested reading for student: p. 371-374, Automotive Collision Work

The next lesson is: undercoats

INSTRUCTOR'S LESSON PLAN
Manipulative Skills

INSTRUCTOR: Herley Blankenship

Block 10
Lesson K8-4

JOB (or operation): Undercoats and Putty

AIM (or purpose): Apply undercoats for refinishing

TOOLS AND EQUIPMENT: Spray gun, air hose, squeegee, putty spreader, sanding block

MATERIALS: Sandpaper, primer, putty applicator

TEACHING AIDS:

REFERENCES: Automotive Collision Repair

I. PREPARATION (of the learner)

1. Important step before color coats
2. Importance of putty
3. Importance of craftsmanship

II. PRESENTATION (of the skills)

Operation or Steps	Things to Remember To Do or Say
1. Apply putty	A. Not very thick B. Sand with block C. Let set at least two hours
2. Apply surfacers	A. At least two coats B. Sand with block C. Coat second time
3. Apply primers	A. Overall bare metal B. Scuff when dry
4. Apply sealers	A. Always use when spraying over maroons or reds
5. Apply enamel sealers	A. Two light coats B. Let dry overnight C. Sand out dirt
6. Apply lacquer sealers	A. Dry fast B. Can sand in thirty minutes
7. Apply cover coats	A. Most when painting over maroons, reds, and whites

III. APPLICATION (practice by learner under close supervision)

1. Students work in pairs
2. Prepare spots and knicks
3. Prime complete car

TEST (performance of skill to acceptable standards)

1. Check finished job
2. Put results on progress chart

Suggested reading for student: DuPont Refinishing Guide

The next lesson is: color coats

INSTRUCTOR'S LESSON PLAN
Manipulative Skills

INSTRUCTOR: Herley Blankenship

Block 10
Lesson D8-5

JOB (or operation): Color coats

AIM (or purpose): Refinish car with top coats

TOOLS AND EQUIPMENT: Spray gun, air hose, blow gun

MATERIALS: Paint thinner, strainers, paddles, cleaner, tack rags

TEACHING AIDS: Color chip chart

REFERENCES: DuPont Refinishing Guide, Automotive Collision Repair

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I. PREPARATION (of the learner)

1. Personal experience
2. Extreme accuracy is important
3. Errors cause a lot of work and money

II. PRESENTATION (of the skills)

Operation or Steps	Things to Remember To Do or Say
1. Thinning of paint	A. Always read labels B. Check for right thinners C. Check gun before beginning
2. Gun adjustment	A. Check gun patterns B. Check air C. Check air hose for water
3. Apply tack coats	A. Not too heavy a coat B. Hold gun at least eight inches from metal
4. Apply color coats of lacquer	A. 50% overlap B. No runs C. One panel at a time D. Metallic cross coat E. Last coat, use retarder F. Let set overnight and buff
5. Apply color coats of enamel	A. Use more air pressure than lacquer B. Tack first C. Heavy coat on the second application D. Never more coats than three coats

Operation or Steps	Things to Remember To Do or Say
6. Ask questions	A. What does thinner do to paint? B. What is the difference between lacquer and enamel? C. What is meant by color coat? D. What is a tack coat and it's purpose?

III. APPLICATION (practice by learner under close supervision)

1. Students assigned in pairs
2. Boys not painting will be sanding and masking
3. Paint complete car
4. Paint panels

TEST (performance of skill to acceptable standards)

1. Test #5 on Friday
2. Inspect work on completion
3. Put on progress chart

Suggested reading for student: DuPont Refinishing Guide

The next lesson is: unit IX, Glass and Upholstery

INSTRUCTOR'S LESSON PLAN
Related Technical Information

INSTRUCTOR: Herley Blankenship

Block 10
Lesson K8-4

SUBJECT: Automotive Refinishing Specialist

AIM (or purpose): Student will gain a knowledge of job opportunities in auto refinishing

TEACHING AIDS: Job application

MATERIALS:

REFERENCES: Occupational Outlook Handbook, U. S. Department of Labor
W. Willard Wirtz, Sec., #1450

I. PREPARATION (of the learner)

1. Personal example
2. Demands for refinishing specialist

II. PRESENTATION (of the information)

Instructional Topics	Things to Remember To Do or Say
1. How many employed?	A. Have students conduct individual research concerning body shops and report to class on employment possibilities across the nation and average salaries B. Present latest figures from Dictionary of Occupational Titles concerning job opportunities in the auto body field C. Have a guest speaker who represents the industry speak to the class
2. Employment outlook	A. Increase 1970-75 B. 500 per year C. New paints D. Increase of cars
3. Training qualifications and advancements	A. Vocational schools B. Helpers C. Apprenticeships D. 3 to 4 years E. Advancement F. Own shop

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Instructional Topics	Things to Remember To Do or Say
4. Earnings and working conditions	A. Percentage B. Weekly plus commission C. 40-48 hour week D. $3.60-$5.40 an hour E. Unions and organizations
5. Employment information	A. Local shops B. State Employment Commission C. Manpower Development and Training Act

III. APPLICATION (drills, illustrations, analogies, oral questions or assignments)

1. Class discussion
2. Questions and answers
3. Assign student to investigate local shop pay scales and employment opportunities

TEST (final check on students' comprehension of material presented)

Fill out job application

Suggested reading for student:

The next lesson is: field trip to local Ford dealership

INSTRUCTOR'S LESSON PLAN
Related Technical Information

INSTRUCTOR: Herley Blankenship

Block 10
Lesson K8-11

SUBJECT: General: Candy Apple Colors

AIM (or purpose): Broaden students' knowledge in colors

TEACHING AIDS: Color chips of paint

MATERIALS: Candy apply finish material

REFERENCES: Hobson, W. T.; Automotive Refinishing, DuPont Refinisher News, p. 88

I. PREPARATION (of the learner)

1. Highly reflective paint
2. Very glossy
3. Used only on show cars
4. Very difficult to spray

II. PRESENTATION (of the information)

Instructional Topics	Things to Remember To Do or Say
1. Preparations	A. Sand complete car B. Prime complete car C. Seal car with light grey sealer
2. Base coat	A. Gold or silver B. Two coats C. Very even coats. Cross spray D. Do not touch after this coat
3. Top coat	A. At least eight coats B. Let dry for fifteen minutes C. All coats evenly sprayed
4. Rubbing	A. Use buffer or rub by hand B. Use fine compound C. Do not wax for two weeks

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III. APPLICATION (drills, illustrations, analogies, oral questions, or assignments)

1. Students write down steps in notebook
2. Check handouts and file in notebook
3. Questions and answers

TEST (final check on students' comprehension of material presented)

Test: Each student will prepare a practice panel and apply a candy apple finish to the satisfaction of the instructor and other class members

Suggested reading for student:

The next lesson is: automotive refinishing specialist

INFORMATION SHEET

IN

AUTOMOTIVE FINISHING

SUBJECT: Paint Spray Guns

Spray guns are precision instruments, constructed as accurately and tested as carefully as precision tools and gauges permit. When completely assembled each spray gun is tested for pattern size and uniformity with the paint and accessory equipment for which the gun was designed, and if given a reasonable amount of care, will produce good results throughout a long life.

Neglect and carelessness are responsible for the majority of spray gun difficulties despite the fact that proper care of the gun requires but little time and effort. Thorough cleaning of the gun and accessory equipment immediately after use, lubrication of bearing surfaces and packings at recommended intervals, and proper handling (never drop or throw a gun) are important factors in the care of a spray gun. To obtain best results, observe the following suggestions:

1. Do not immerse a gun in solvent. It will destroy lubricants and packing.

2. Lubricate the air valve stem daily with a few drops of light oil.

3. Keep all packings, such as fluid needle packing, soft and pliant by occasional oiling. Packing gland nuts should be tightened with the fingers only.

4. If the gun is to remain idle for several weeks or longer, apply a light coating of grease to all steel parts to prevent corrosion.

5. It is unnecessary to dismantle a gun for daily cleaning if it is to be used the following day. Dismantle and clean it, though, if it is to remain idle longer than overnight.

6. Never use caustic alkaline solutions for cleaning; they destroy aluminum alloy.

7. Immediately after using a spray gun and cups, remove all excess material from the cup, put in a small amount of suitable thinner, and spray it through the gun. Wipe all parts clean and dry.

8. The air cap and fluid tip determine the shape and uniformity of the spray. An accumulation of dirt or paint on the outside of the fluid tip will distort the spray; to correct, remove the air cap and immerse it in solvent. If it is necessary to ream the holes in the air cap, use a broom straw, pipe cleaner or a soft piece of wood. A wire, knife, or other hard implement may damage the air cap beyond repair.

9. When replacing the fluid tip, make certain that it is tightened securely in position.

10. Make certain that the passages of the gun are open and free of material accumulation.

OBJECTIVE

To explain proper maintenance of spray gun.

GENERAL INFORMATION

The spray gun is used to apply paint and primers in even patterns.

This operation explains the care and maintenance of the spray gun.

The spray gun must be cleaned immediately after spraying materials.

TOOLS AND EQUIPMENT

Spray Gun

Spray Gun Wrench

Air Hose

Cleaning Pan

Blow Gun

Clean Rags

NOTE!!!

The spray gun is a very delicate piece of equipment. Proper maintenance is a must if it is to perform properly.

PROCEDURE

1. Disassemble gun.
2. Take out all gaskets and packing.
3. Put in cleaning solvent.
4. Clean each part and blow off with air.

CAUTION When Using Blow Gun, Point In Opposite Direction

5. Reassemble carefully.
6. Oil all moving parts.
7. Put thinner in gun and check adjustments.

INFORMATION SHEET

IN

AUTOMOTIVE FINISHING

SUBJECT: Hints on Safety and Precautions for The Automotive Painter

In many automotive paint shops little, if any, attention is paid to safety practices, precautions and cleanliness which in this trade are closely tied up with paint shop safety. The attention given to these factors will result in a safer and cleaner place in which to work as well as better tools and equipment with which the automotive painter can do a better job.

The following list of hints will aid the automotive painter to prove the saying that "a clean shop is a safe shop":

1. Always place car stands under a car when removing wheels. Do not leave the car supported on the jack because hydraulic and mechanical floor jacks may suddenly let the car fall. Some one may drive another car into the one you are lifting and knock it off the jack. You may be injured as the car falls. Parts of the car may be broken or damaged.

2. Be sure that the paint shop is well ventilated. Lacquer and enamel dust in sufficient concentration is very explosive.

3. The safest place in which to spray automotive finishes is in a well ventilated spray booth. Many booths have a filtered air supply at about 1/2 lb. per square inch pressure.

4. Spray booths should be equipped with vapor proof lighting fixtures. Spray dust from both lacquer and synthetic enamel is highly explosive. Ordinary exposed lamp bulbs may be accidently hit or broken or they may burst from one of many different causes. This may cause a spark that would result in the spray dust exploding. Such an explosion invariably causes damage to the car, to the paint spray booth, to the painter or to all. Serious fires have resulted from such explosions.

5. Spray booth ventilation systems should have the electric motor mounted outside the booth or use an explosion proof electric motor.

6. It is best not to drive cars into the paint spray booth. Push them in. The exhaust, the blast from the engine fan and the rapid motion of the car will stir up dust and dirt. Also, in most cases the car has been masked off before being moved into the spray booth and as the windshield is covered with masking materials, the driver's vision would be obstructed.

7. It is a safe practice to disconnect the battery during the time the car is to be in the paint spray booth. When this has been done, the danger from sparks caused by the starter, horn and lights will have been eliminated. Also, a person not assigned to the job cannot easily move the car before the proper time.

8. It is not safe to run an automobile engine in a closed room or shop without provisions for carrying the exhaust fumes which contain the dangerous carbon monoxide (CO) to the outside.

9. When painting, liquids, particularly thinners, are stored in drums and safety dictates that the drum be grounded to carry off static electricity generated when liquid is drawn from the container.

10. There should be a metal connection between the drum and the container into which the liquid is being drawn so that any static electricity generated will be carried from the container to the drum, thence to the ground.

11. It is dangerous to apply air pressure to a drum container to force the liquid out. Too much pressure would cause the drum to explode.

12. A careful automotive painter always wears a respirator of the correct type whenever he is spraying automotive or other types of finishes, in either the paint spray booth or out in the shop. Spray dust from synthetic lacquer collects in the nasal and lung passages, also causing trouble. Such dust inhaled will be absorbed by the system. Many painters have suffered painful kidney ailments from breathing paint spray dust.

13. It is always safest to wear goggles when using the disc sander to remove the old finish. Goggles protect the eyes from flying particles of paint and abrasive from the disc grinder. These sharp particles moving very rapidly can cause severe damage to the eye. Remember, you can buy more goggles but you have only ONE PAIR OF EYES.

14. Every paint shop should be provided with a sufficient number of waste cans with self-closing lids. Paint rags, scraps, and waste matter that contain paint are subject to spontaneous combustion when left exposed to the air. Waste cans with self-closing lids, by shutting off circulation of air, cut down on the amount of oxygen in contact with the paint particles, thereby almost eliminating the chance of spontaneous combustion and fire.

15. As a fire prevention measure, the paint shop should be equipped with enough fire extinguishers so that every man in the shop is close to one extinguisher. Also, locate at least one extinguisher in the paint spray booth.

16. Do not light matches or smoke in a paint spray booth, as the spray dust from lacquer and enamels, when mixed with air in sufficient quantity, are highly explosive.

17. Always use lacquer thinner for cleaning spray gun. Lacquer thinner will rapidly dissolve the lacquer and wet synthetic enamel left in the paint gun. Other materials, such as gasoline, naptha, and kerosene when used to clean paint spray guns, do not completely dissolve automotive finishing material being used in the gun. A gummy deposit left in the gun is hard to remove. It may also cause trouble when the spray gun is used again.

18. Never soak the complete spray gun in thinner as this destroys the seals and washes away the lubrication.

19. Lubricate the working parts of the spray gun at frequent intervals. It will work easier and last longer.

20. Always use the correct size wrench when disassembling or assembling a paint spray gun. The safest practice is to use non-sparking tools.

21. Most paint spray guns are provided with a hook by which the gun can be hung when not in use. Always hand the gun by this hook. Never place it down on the container or on a high shelf as a fall will damage the spray nozzle or the container or both.

22. Be sure to clean the spray gun thoroughly after each time it has been used or when changing colors to be sprayed. Dried lacquer can be softened and dissolved with lacquer thinner but

synthetic enamel that has dried cannot be dissolved with any thinner. A spray gun in which synthetic enamel has dried must be dismantled and the dried enamel scraped out or the gun discarded. If the gun is not cleaned when changing color, the residue of the first color left in the gun will affect the next color to be used in the gun.

23. Never use caustic alkaline solution for cleaning the paint spray gun, as such a solution will damage the aluminum and other soft metal parts.

24. Always be sure that the air compressor is correctly lubricated. This will help keep down the amount of water carried through the air lines into the air transformers, and condenser or separators.

25. Every day, bleed the water from the air storage tank. This will help keep down the amount of water carried through the air lines into the air transformers and condenser or separators.

26. Air transformers and condensers or separators require at least daily bleeding to keep the moisture and oil in the air to a minimum.

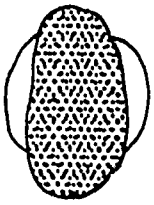
27. For best painting results the temperature of the shop, booth, equipment, and the spray finishes should be 70° to 80°. Paint manufacturers recommend that paint of correct consistency be sprayed at a temperature of 78°.

28. Open containers in which volatile liquids are stored are dangerous. There is always a small amount of volatile liquid left in every empty container. These liquids will evaporate and fill the empty container with an explosive mixture. A spark from any source can cause serious explosion and fire.

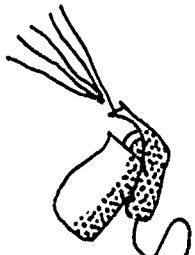
29. Keep all empty containers open so dangerous pressures cannot be built up in them.

30. Have a place for everything and keep everything in its place. By having everything in its place a paint shop will appear much neater and will be easier to keep clean. Supplies will be much easier to find. An inventory is much easier to take and additional stock more readily ordered.

SPRAY PATTERNS AND THEIR CAUSES

1. 

Spray guns can be adjusted to either round or oval patterns.



2. 

Top heavy patterns caused by horn holes partly clogged, obstruction on top of fluid tip, dirt on air cap seat or fluid tip seat.

3. 

Heavy bottom pattern caused by horn holes partly clogged, obstruction on bottom side of fluid tip, dirt on air cap seat or fluid tip seat.

4. 

Heavy right side pattern caused by right side horn holes partly clogged, dirt on right side of fluid tip, or twin jet air cap, right jet clogged.

5. 

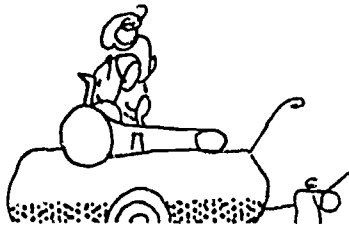
Heavy left side pattern caused by left side horn holes partly clogged, dirt on left side or fluid tip, or twin cap left jet clogged.

6. 

Heavy center pattern due to too low setting of the spreader adjustment valve, with twin jet cap too low, an atomizing pressure or paint too thick, too large a nozzle for the material being used, or too small a nozzle.

7. 

Split pattern due to air and paint not being properly balanced. Reduce width of spray pattern by means of spreader adjustment valve or increase fluid pressure.



INFORMATION SHEET

IN

AUTOMOTIVE FINISHING

SUBJECT: Separators and Air Hose

One of the most neglected pieces of equipment in most shops is the air separator or transformer, yet it is most important in the production of a good job. The air separator is designed to take oil and water out of the air line, thereby preventing moisture from passing through the gun onto the surface to be painted. Moisture so deposited may become extremely troublesome to the refinisher.

A sectional view of the air separator shows that air always enters at the top and travels downward (just inside the outer shell), passing on through a maze of copper shavings which cool the air and at the same time remove foreign particles. After further downward travel, the air stream makes a 180 degree turn and passes upward through the core of the unit. In making this turn, the air deposits some of its moisture and solid matter by gravity into the settling chamber, and immediately afterwards comes into contact with cold baffle plates which cause it to give up further moisture through felt filter pads, and leave the unit through the central portion at the top.

It is, of course, necessary to drain the bottom of the settling chamber several times a day, the frequency depending on the humidity of the atmosphere and the amount of spraying done. By unscrewing the nut at the bottom of the unit, the entire center core can be removed. Occasionally, it may be necessary to renew these pads, but usually thorough cleaning of the old ones will suffice.

It is advisable to test occasionally the air line for oil, because sooner or later the compressor rings will become worn and let oil pass. Replacement is preferable because it will cost less to replace compressor rings than it will to repaint the customer's car or lose a customer.

Always place the separator as far from the compressor and as near the gun as possible; with this arrangement the air will be cooled before it reaches the extractor and condensation will have already taken place.

The use of long sections of small hose is likely to cause unnecessary loss of pressure between the transformer gauge and spray gun, and such practice should be avoided. On one occasion an investigation showed the 105 pounds on the transformer gauge dropped to 48 pounds at the gun. The operator was spending hours of unnecessary labor on sanding and rubbing because of inadequate pressure. The installation of hose of the proper size eliminated the trouble.

Air hose is available in three common sizes: one-fourth, five-sixteenths, and three-eighths inch, inside diameter. Since the larger hose will handle a greater volume of air without a drop in pressure, three-eighths inch is the preferred size. However, with a slight sacrifice of efficiency (in the interest of a lighter and more flexible hose), the five-sixteenths can be used. The one-fourth inch size is not recommended for use with standard production equipment and under no conditions should it be used in lengths over twelve feet.

There are, of course, other causes for loss of volume and pressure in an air line, including leaky valves, damaged hose, and worn or loose-fitting hose connections. Such conditions are serious and all affect the volume and pressure of air delivered to the gun; such defects are easily detected, and there is no reason for permitting them to exist.

INFORMATION SHEET

IN

AUTOMOTIVE FINISHING

SUBJECT: Cleanliness for The Auto Paint Job

Few industries fabricating iron and steel products take greater care in the final finishing of their product, than the automobile manufacturing industry. The principal reasons for this are:

1. There is considerable investment in the cash value of a newly made automobile that must be protected.

2. The necessity for producing a product that will appeal to the eye of the prospective purchaser.

Both of these objectives are reached through the use of paint, enamel or lacquer for the final finishes of the automobile. While the automotive painter is chiefly interested in reconditioning and refinishing the original paint, from time to time, a knowledge of the material to be worked with, how it is applied, and the treatment that the original finish has received before returning for reconditioning will be helpful to him and increase the possibility of doing a job of good workmanship that will satisfy the owner. Most car owners take pride in driving a good looking car and will patronize the shop that they think gives them the best job and the most service for their money.

No where in the automotive field is cleanliness so important (by cleanliness is meant the work must be clean as possible by physical means as well as chemically clean) as in the preparation of the surface of an automobile for painting whether a complete repaint job or a spot repair job. This is most important if the finish is to stay on the car, hold its gloss, and withstand the exposure to which the average car is subjected.

There are probably as many methods and procedures for refinishing automobiles as there are automotive painters, as each man usually has his own way of doing a job. If there is any one "best way" to do a refinishing job, it is to follow the instructions of the manufacturer of automotive finishes as to the materials to use and the application procedures, especially those about cleaning the surface before applying the refinish material.

Cars are brought into the auto paint shop for refinishing in about every state of decreptitude. Every one of these jobs must be handled and processed according to its condition when received. Some refinish jobs are wrecks that have been repaired, some are almost devoid of any paint, still others may be brought in simply for a change of color or to rejuvinate the original finish as a matter of preventive maintenance. In every one of the cases mentioned above, it is necessary to clean the surface thoroughly before applying any finish material. The metal and old paint must be free of wax, grease, rust and moisture. In fact some of the best

shops strip the paint from the fenders and the hood as a matter of regular procedure for every repaint job, as this provides a better and cleaner surface to refinish over bare metal than to apply the finish over old and damaged finishes. This procedure also provides opportunity to build up a perfect finish on prominent parts where any surface imperfections or unevenness is instantly apparent.

If every paint job could be stripped down to the bare metal, it would be a comparatively easy job to develop a standard procedure to fit the majority of the complete refinishing jobs. However, since few owners desire to pay for this kind of a job or to tie up their car for the time necessary to do a complete job, work must be taken in as it is and done according to the owner's wishes or ability to pay.

Nowadays practically every car owner, at some time, has used polish containing wax or auto wax and so a larger number of cars accumulate a thick coating of this wax especially in the corners and around the mouldings. It must be removed before any refinishing is done as any wax left on the job will interfere with the drying and the sticking of the new finish to the old. This will even cause trouble after considerable time has elapsed.

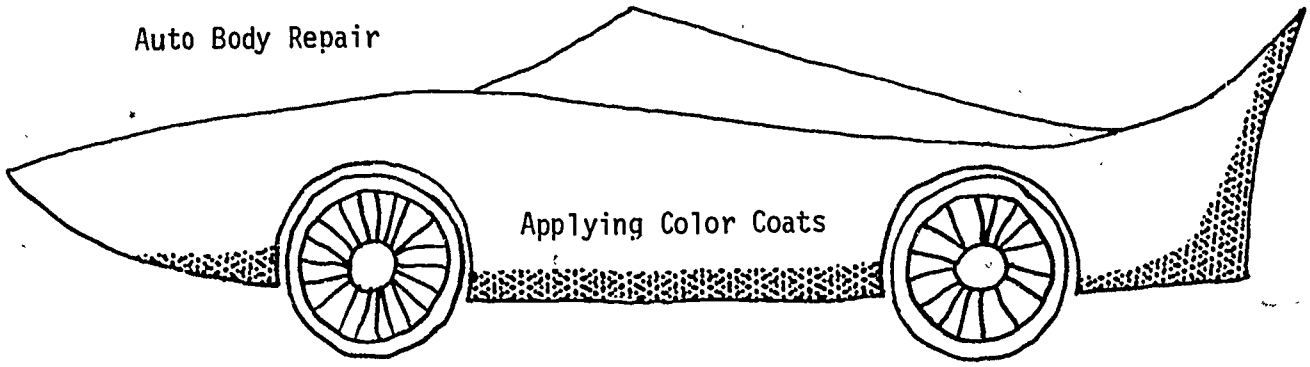
After body and fenders have been gone over, paint sanded, metal repair work done, the rust spots removed and sanded out, a very complete cleanup of the whole area or car to be painted should follow next (a mixture of one-half naptha and one-half lacquer thinner of preferably some good wax remover may be used). Every part of the entire body or the whole area to be refinished should get a good scrubbing to remove all wax and dirt. Particular attention should be paid to the areas around door handles, door hinges, mouldings and recesses because more wax will accumulate at these places than on a flat exposed surface. Extra attention should be given to these places and the rust spots.

Even the perspiration on the operator's or painter's hands, which is always present on the surface of the skin will cause trouble as it contains corrosive acids and alkalis. The marks left by fingers and hands on the clean metal of paint surfaces will invariably cause trouble for the painter. The best policy is to never touch the surface to be finished after it has been given the final cleaning.

The careful painter will take extra precautions because each job that goes bad is a reflection on the ability and reputation of the automotive refinisher. Some car owners will protest when they receive a low quality job and the refinisher or shop will have the opportunity to correct mistakes while still other owners will say nothing to those who did the job and go elsewhere for other needed work.

An automobile painter who does, every time, the best job of which he is capable, soon builds an enviable reputation for high quality workmanship.

Auto Body Repair



GENERAL INFORMATION

Today's standard production of cars are manufactured in many various colors and shades. These automobiles are painted with four different types of paint. They are lacquer, acrylic lacquer, enamel, and acrylic enamel.

The application of color coats differs in methods of application according to the type of paint being used.

Deterioration of the paints is caused by many different factors. The most common of these is weather conditions.

PURPOSE

To gain knowledge and skill in applying color coats to professional standards.

TOOLS AND EQUIPMENT

1. Spray Gun
2. Spray Gun Wrench
3. Air Hose
4. Blow Gun
5. Tack Rags
6. Clean Rags
7. Wheel Covers

SAFETY PRECAUTIONS

1. Never paint around open flame.
2. Always wear a mask when spraying thinners and paints.
3. Keep thinners and paints away from eyes and mouth.

NOTE !!!

Always read directions before mixing paint.

PROCEDURE

1. Remove all dust-collecting objects from spray booth and wash floor thoroughly

2. Use air gun and remove all dust from around windows, doors and mouldings

3. Use prepsol to clean surface of car

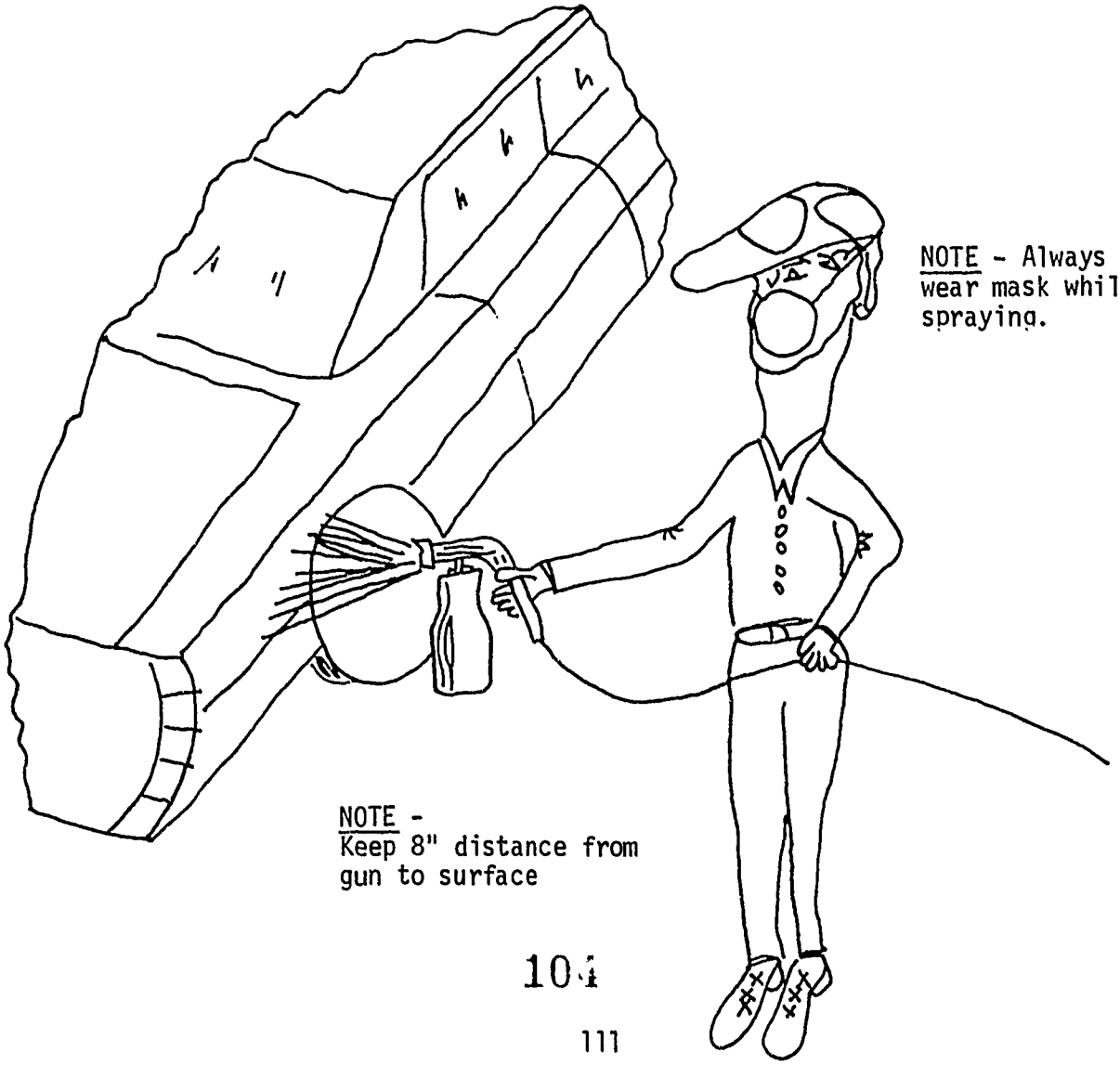
4. Use tack rag over complete surface of car

5. Spray tack coat first. Let set for about 15 minutes

6. Spray next coats more heavily. CAUTION!! Always spray in well ventilated area.

7. When spraying metallics, cross spray every other coat

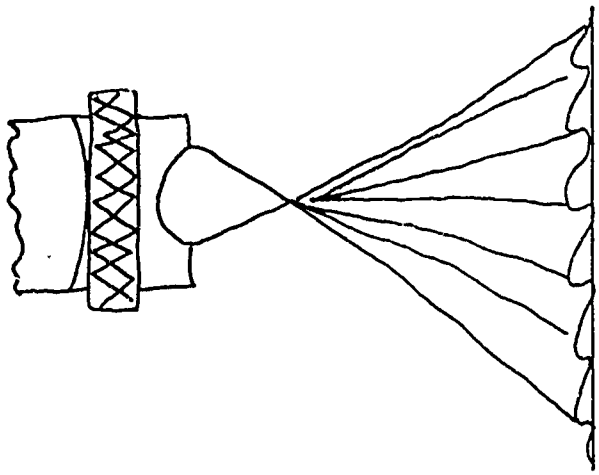
8. On top coat, double coat each panel



NOTE - Always wear mask while spraying.

NOTE - Keep 8" distance from gun to surface

SPRAYING PROCEDURES AND AILMENTS
K8-5-5

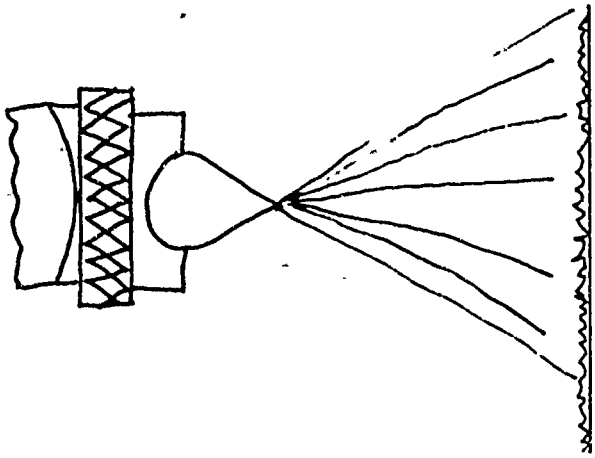


WRONG

Heavy, coat with sags, ripples or orange peel

REASONS

Dirty air nozzle
Gun too close
Paint too thin
Low air pressure
Stroke too slow
Too much overlap



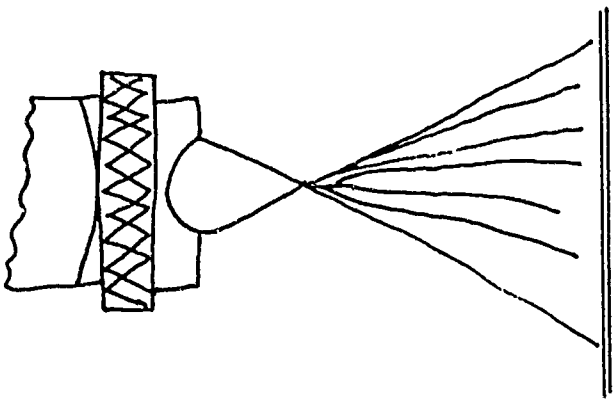
WRONG

Thin coat, rough, dry, no lustre

REASONS

Wrong size nozzle
Gun too far away
Paint too heavy
Too much air
Stroke too fast
Not enough overlap

NO SMOKING
WHILE SPRAYING PAINT



RIGHT

Medium coat, good flow-out with hardly any orange peel and no sags

REASONS

Gun clean and properly adjusted
Gun distance okay
Proper thinning
Right amount of air
Stroke okay
Overlap 50%

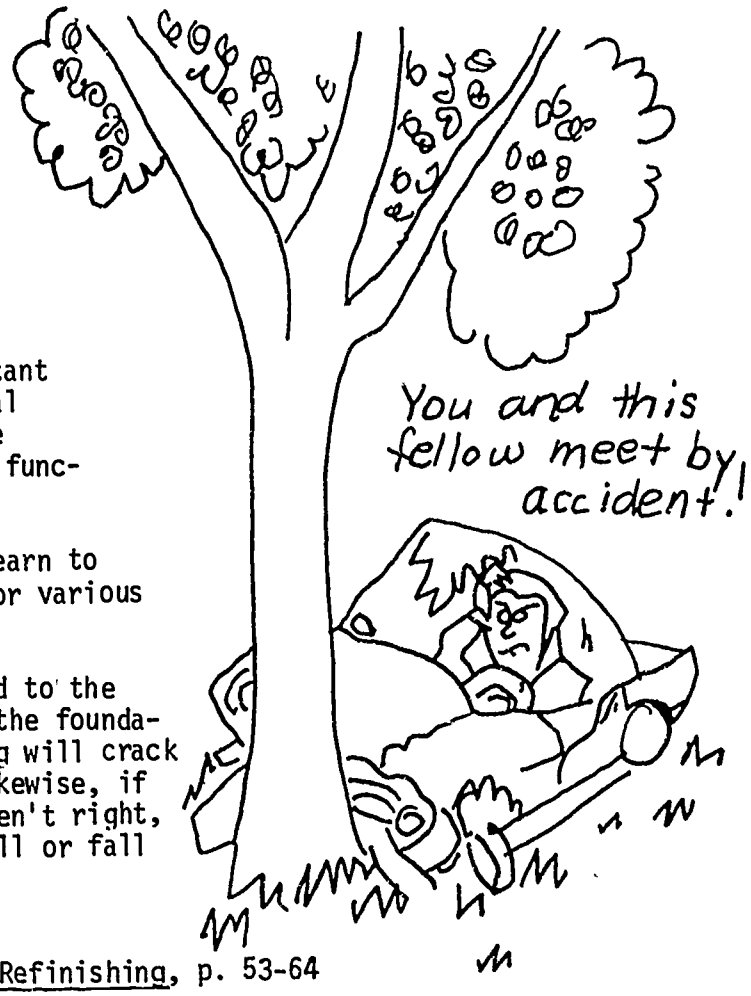
Follow the Rules and always come out smiling

ASSIGNMENT SHEET

Auto Body Repair

Related Study Assignment

UNDERCOATS



INTRODUCTION

Undercoats are very important materials used between the metal surface and color coats. These undercoats have many different functions and purposes.

In this lesson you will learn to select the proper undercoats for various jobs.

Undercoats can be compared to the foundation of a building. If the foundation is not right, the building will crack or lean, or may even fall. Likewise, if the undercoat or undercoats aren't right, the top coats may crack or swell or fall off.

Read the following

W. T. Hobson, Automotive Refinishing, p. 53-64

Questions to be answered and handed in:

1. What is an undercoat?
2. What is the basic use of primer?
3. What is meant by adhesion?
4. What is the average drying time before sanding primers?
5. What is a sealer?
6. What is a primer-surfacer?
7. What is putty and its use?
8. What is meant by enamel surfacer?
9. You can paint lacquer over enamel? (True or false)
10. What is the mixing ratio for primer-surfacer and thinner?

APPENDIX C

SUGGESTED EQUIPMENT LIST

SUGGESTED EQUIPMENT

A. Student and Instructor Hand Tool Kits

Students will work out of tool room

Quantity	Description
1	Tool box, metal with lock
1 each	Chisels; cold 3/8"x5-1/2", 1/2"x6", 3/4"x7-1/2", 1"x10"
	Chisel; dia. point 3/8"x7"
1	Chisel; cape 5/8"x7"
1	Chisel; round nose 1/4"x6"
1	Chisel; slim taper 8" regular taper
1	Chisel; fender, seat
1 each	Clamps; C-type 2", C-type 4"
1	Dent puller
1	File; 14 VH half round file
1	File; 14 V7 curved tooth file, 7 teeth per inch
1	File; adjustable grip handle
1	File; 14 V-curved tooth file, 8 teeth per inch
1	File; 14 VHr half round file
1	Floor creeper
1	Goggle; for welding oxy-acetylene
1	Hammer; ball peen, 16 oz.
1	Hammer; dinging
1	Hammer; finishing, heavy
1	Hammer; finishing, light
1	Hammer; finishing, long body
1	Hammer; cross peen
1	Hammer; picking
1	Head liner tool
1	Hacksaw, adjustable
1	Pliers; vise grip 8", locking one hand release
1	Pliers; diagonal 7", heavy duty
1	Pliers; needlenose 6"
12	Pliers, vise grip with welding end
1	Pry-bar 30"
1	Pry-picks and pry bar
1	Punch and chisel set
1	Putty knife
4	Rubber sanding block
1	Screwdriver; Phillips, #1 point - 3/16" dia. x 3"
1	Screwdriver; Phillips, #2 point - 1/4" dia. x 4"
1	Screwdriver; Phillips, #3 point - 5/16" dia. x 6"
1	Screwdriver; round shank, steel 5/16" dia. x 12"
1	Screwdriver; round shank, steel 1/8" dia. x 4"
1	Spoon; double ended
1	Spoon; spring hammering
1	Spoon; 45° drive
1	Steel tape; 6'
1	Tin snips; duckbill 12-3/4"
1	Tin snips; aviation type, right hand
1	Tin snips; pattern combination 12-3/4"
1	Trouble light; drop cord w/outlet
1 each	Wire brush; fine and medium
1	Wrench; open end, set, 1/4" to 1-1/8", 10 pieces
1 set	Wrenches; allen, .050 to 3/16"
1	Socket set, 1/2" square drive, 16 pc. set in box

B. General Tool Specifications

Quantity	Description
1	Abrasive disc trimmer
2	Air chuck; tire
2	Air gauge; tire
6	Air hose; 1/4" hose, 25' lengths (DeVilbiss)
2	Air hose; 5/16", 50' lengths (DeVilbiss)
1	Automatic oiler - (metal removal #100-A)
1	Battery booster; cable set, 8'
1	Bench drill stand, fits 1/2" drill, 4" feed (Black and Decker #22145)
1	Body shop power chisel set
1	Bolt and nut cutter; magnet, retrieving
2	Carbon drill brushes
2	Chisels; bar 5/8"x18"
2 each	Chisels; three sq. 8" long, bastard, smooth, 2d cut
1	Clamp; C-type 8"
4	Cleaners; for oxy-acetylene
12	Connections; air PHC 4566 and HC 4509 QD halves
12	Connections; air PHC 4527 and HC 4511 QD halves
6	Dollies; egg-shaped
6	Dollies, railroad or general purpose
6	Dollies, radius or foot
6	Dollies, bead
6	Dollies, shrinking
6	Dollies, semi-elliptical or heel
1	Drag link tool
4	Drain pans; for radiators
2	Drill bit sets; high speed, eight drills in plastic case, sizes 1/16" to 9/32" by 32ds; straight shank, 1/2" round shank, twist type
2	Drill bit sets; high speed, eleven drills in plastic case, sizes 1/16" to 3/16" by 64ths; straight shank, 1/4" round shank, twist type
1	Drill bit set; carbon tip, 29 drills, 1/16" to 1/2" by 64ths, straight shank, 1/2" round shank, twist type
4	Dusting guns; DGA 511, air (DeVilbiss)
2	Files; flat for aluminum, special teeth, 10" long
2 each	Files; flat mill 8" long, bastard-smooth-2d cut
2 each	Files; half round, 10" long, bastard-smooth-2d cut
2 each	Files; hand, 6" long, bastard-smooth-2d cut
2 each	Files; mill, 8" long, bastard-smooth-2d cut
2	Files; mill, 8" long, bastard-I.R.E.
4	Files; triangular, 8"
2 each	Files; round 8" long, bastard-smooth-2d cut
1 each	Files; slim taper, 8", regular taper, slim taper, extra taper
1 each	Files; three square 8" long, bastard-smooth-2d cut
3	Hammers; ball peen, 32 oz.
3	Hammers; upholstery type, magnetic
2	Hammers; two-way
4	Hammers; picking, long neck and handle
2	Hammers; sledge, 6 lbs.
2	Hammers; sledge, 8 lbs.

B. General Tool Specifications (continued)

Quantity	Description
3	Hammers; blacksmith, 43 oz.
4	Hammers; rubber mallets
4	Helmets; for arc welding
1	Hole saw set; 4/8" to 1-1/4", complete kit
1	Hose accessories kit; 4/16" (to go with hose gun)
1	Light air hose, 25'
8	Lighters; for oxy-acetylene tanks
2	Oil can spouts
3	Oilers; spring action type, w/spout
1	Panel; Hl-holding unit/ complete (H. K. Porter Co.)
2	Picks; curved - short
2	Picks; straight
2	Picks; curved - long
1	Pipe die set; 1/8" to 1"
2	Pliers; brake spring 8"
4	Pliers; hose clamp pliers
2	Pliers; locking strip tool
4	Pliers; lineman 7"
1	Pliers; battery
1	Puller; set of various sizes for pulleys
2	Remote cup; two quart, pressure feed, w/pressure
4	Rolling head bar; 18"
2	Screwdrivers; offset, 3" long 3/16" tip, steel
2	Screwdrivers; offset, 6" long 1-3/32" tip, steel
2	Screwdrivers; heavy duty, 1/2"x18"
2	Screwdrivers; heavy duty, 1/2"x12"
4	Screwdrivers; offset, hammer head 7"
4	Screwdrivers; offset, hammer head 4"
5	Screwdrivers; round shank, steel 1/4" dia. x 1-1/4", (stubby)
2	Screw extractors; 5/64" drill, 7/14" drill, 5/32" drill, 1/4" drill, 17/64" drill, 13/32" drill (easy out set)
3	Socket sets; 1/4" drive, contains flex handle, reversible ratchet, speeder, slide "T", 2" and 6" extension, universal joint and 12 sockets in a metal box; socket sizes 1/4", 9/32", 5/16", 11/32", 3/8", 7/16", 1/2" and three 8 point sockets 1/4", 5/16", 3/8" (Proto)
3	Socket sets; 1/4" drive, general purpose, 18" flex handle, reversible ratchet, speeder, 5" and 10" extensions and twelve 12 point sockets in a metal box; sizes 7/16", 1/2", 9/16", 5/8", 11/16", 3/4", 13/16", 7/8", 15/16", 1", 1-1/16", 1-1/8" (Proto)
1	Socket set; 3/4" drive, contains flex handle, reversible ratchet, 6" extension, thirteen 12 point sockets in a metal box; sizes 1-1/16", 1-1/8", 1-3/16", 1-1/4", 1-5/16", 1-3/8", 1-7/16", 1-1/2", 1-5/8", 1-3/4", 1-7/8", 2" (Proto)
2	Solder guns; 200-450 watts. 115v., 60 cy., hand, heavy duty (Wen 450-45F7)
12	Soldering paddle sets
2	Spoons; surfacing spoon
4	Spoons; 90° drive
2	Spoons; driving spoon
2	Spoons; beading spoon
2	Spoons; edger spoon
2	Spoons; quarter panel spoon

B. General Tool Specifications (continued)

Quantity	Description
2	Spoons; side apron spoon
2	Squares; 16"x24", metal
12	Stems; air, (DeVilbiss, P-HE-201)
12	Stems, air, (DeVilbiss, P-HC-190)
1	Tap and die set; machine screw sizes - 4x36, 6x32, 8x32, 10x24, 12x24; national coarse sizes 1/4x20, 5/16x18, 3/8x16, 7/17x14, 1/2x13, 9/17x12, 5/8x11, 3/4x10, 7/8x9, 1x8; national fine sizes 1/4x28, 5/16x24, 5/8x24, 7/16x20, 1/2x20, 9/16x18, 5/8x18, 3/4x16, 7/8x14, 1x14; pipe 1/8" and 1/4"/ machine screw sizes of dies 5/8" O.D., 1/4x20 and 28 to 1/2x20 dies are 1/2" O.D.; tools included #121 tap and reamer wrench, #2 tap and reamer wrench, #0E tap and reamer wrench, #58 die stock, #25 die stock, #45 die stock
1	Tin snip; aviation type, left hand
1	Tip-It-Sling
1	Tool toter; for FZ-porto power #19672
1	Trammel gauge
3	Trouble lights; 20' SJO 18/2 cord, rubber handle w/switch, lamp guard (Benjamin model 995T)
4	Trucks; for oxy-acetylene welding tanks
1	Tubing cutter; cap. 1/8" to 1", flared
1	Tubing flaring tool; 1/4", 5/16", 3/8", 1/2"
4	U-joints; 1/2" drive
4	U-joints; 1/4" drive
2	Vises: 5" jaw
1	Vise; for 15" drill press w/screw handle
2	Water hose; 50' long
4	Water pails; 10 qt.
1	Wrench, impac; air type, 1/2" square drive, 1/2" bolt cap (Black and Decker 708)
2	Wrenches; box end wrenches, offset midget type, 3/16" to 11/32"
2	Wrenches; box end, short type 3/8" to 13/16", set
2	Wrenches; combination open end-box sizes 3/8", 7/16",1/2", 9/16", 5/8", 11/16", 3/4", 13/16", 7/8", 15/16", 1-1/16", 1-1/8", 1-1/4"
1	Wrench; adjustable 10" pipe wrench
1	Wrench; adjustable 18" pipe wrench
3	Wrenches; adjustable 6" crescent
2	Wrenches; adjustable 10" crescent
2	Wrenches; adjustable 12" crescent
1	Wrench; adjustable 16" crescent
2	Wrenches; hammer impact wrench set

C. Shop Equipment Specification

Quantity	Description
1	Alignment unit: for head lights, portable (John Beam Model 270)
1	Anvil: 100 lbs.
4	Benches: steel, 72"x20", (Lyon Steel Equipment Co.)

C. Shop Equipment Specification (continued)

Quantity	Description
1	Bench, foreman's, 24"x36"x48" high w/cabinet base
7	Bench, steel, 30"x60"; constructed of heavy gauge steel; sliding doors; nylon roller bearings; recessed handles; cylinder lock; adjustable shelves; back and end stops
3	Benches, welding; gas and arc; angle iron legs, reinforced w/diagonal braces; top and shelf measure 36"x36"; 36" high shield sides and back; top covered with firebrick; 14"x24"x5"; bench drawer
1	Bins, revolving shelf unit
1	Booth w/windows, paint spray; auto-truck model; solid back; paint arrestor exhaust system; 28' inside working depth; approved type light fixtures; exhaust outlet on the top of booth vented to outside; pneumatic safety switch; automatic control kit draft gauge and filters
1	Cabinet, paint; all steel; 4 adjustable shelves; double locking door; cylinder lock and cam type closers locking both typ and bottom 36"x75"x21"
3	Carts, service
8	Car stands: sets (horses) safety standards, five ton 14-5/8 to 24-7/8 (Walker 03-974)
1	Compressor: air, two stage horizontal, 10 hp, 200 psi 120 gal. tank, 220/440 on three phase, 115-230 on single phase, complete w/motor controls, and starter disp. 35 cu. ft. per min. delivery 35 cfm (Champion)
2	Drills; electric, all angle, 1/4", 115 V. 60 cy. (Sioux #1495)
2	Drills; heavy duty, 1/2", 115B, 60 cy. (Sioux #1550)
1	Drying outfit; spot, portable, 24 lamps, 220 volts, single phase or three phase, ball bearing casters, pulls 14.8 amps
1	Align-Rite frame machine
1	Gauge; toe-in standards
1	Grinder; bench type, 7" wheel, 115 V. 60 cy. 1750 rpm, w/brush on one end (Sioux #2017)
2	Grinders, heavy duty
2	Guns, spray (DeVilbiss model #P-MBC 510)
2	Guns, spray - gun with attachable siphon cup, air hose connection 1/4", fluid hose connection 3/8" (Binks model 62)
1	Gun, hose - complete with equipment cleaner (PHD-501)
2	Guns, riveting - handles 1/2", use of 1/8", 5/32", 3/16" dia. rivets (Dayton 4X577)
1	Hydraulic press, 10 ton, complete w/stand, body jack set (Blackhawk 45683)
1	Hydraulic press, 4 ton, complete w/stand, body jack set (Blackhawk 49681)
2	Jacks, bumper type, 1-1/2 ton, 40" rise (Hein-Werner model G-H)
2	Jacks, bumper type, 1-1/2 ton, 40" rise (Hein-Werner model AL-36)
1	Lift, twin post, air-oil operated full hydraulic, 11,000 lbs. cap.
3	Machinist vise, 4" jaws
2	Polisher, 1725 rpm, 115 V. 60 cy. 7" (Sioux #1200)
1	Porto-Power, 28 pieces, hydraulic, 4 ton cap., push and pull lock (AZ-ss)
1	Porto-Power, hydraulic, 10 ton w/attachments (FZ-38)
4	Sanders, air, (Sioux #800)
4	Sanders, air, oscillating type (Sioux #502)
3	Sanders, air or electric, 5000 rpm, 7", heavy duty (Sioux #1267)

Shop Equipment Specification (continued)

Quantity	Description
1	Sander, air, small disc 4" (Metal Removal WRA-1)
1	Sander, feather-edging type, air, finishing sander (Black and Decker 805)
2	Separators, air type w/regulator and gauges, 100 cfm. cap. 4 outlets
1	Shear, 16 gauge, heavy duty (Black and Decker 416)
1	Vacuum cleaner, wet or dry, heavy duty, 115/230 V. 60 cy. w/cord and plub (Black and Decker)
1	Welder; spot, 2 gum type, fuse weld, 115 V. 30 amps, cap. 1/8", 1.5 KVA (Miller 12-300)
1	Welder; 1AC-DE, arc (Hobart model TR-250 amp)
4	Torch-cutting gauges, torch, tips; oxy-acetylene, four welding tips, 1/16" to 1/8" to 3/16", 1/4" to 3/8", cutting assembly, single stage, oxygen regulator, 60 and 500 lb. gauge, hose 3/16" 25' long, torch lighter, tip cleaner, combination wrench for welding tip and cutting tip, handy metal box (Aero-Jet 22-003)
2	Wrench, air impact; 1/2" square drive; 5/8" bolt size cap. 6 sockets and metal case
2	Wrenches, air impact; 3/8" square drive (Sioux socket and case)
2	Pneumatic wrenches w/sockets and carrying case (Sioux or Chicago)
2	Sander/Filer, (Rodac 8000)
2	Sander, Orbital Pneumatic (Rodac 820)
1	MIG welder and spot attachment (Millermatic 35)
1	Steam Jenny (model 750)